Bachelor of Technology (Biotechnology), UIET, KUK
Credit-Based (2021-22 Onwards)
SCHEME OF STUDIES/EXAMINATIONS (*Semester -III*)

S.No	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	BTS-201	Biochemistry	3:0:0	3	3	75	25	0	100	3
2	BTS-203	Microbiology	2:0:0	2	2	75	25	0	100	3
3	BTS-205	Molecular Biology	3:0:0	3	3	75	25	0	100	3
4	BTS-207	Genetics and Cell Biology	3:0:0	3	3	75	25	0	100	3
5	BTS-211	Cell and Molecular Biology Lab	0:0:4	4	2		40	60	100	3
6	BTS-213	Biochemistry Lab	0:0:3	3	1.5	-	40	60	100	3
7	BTS-215	Microbiology Lab	0:0:3	3	1.5		40	60	100	3
8	PTS-201	Technical Seminar	0:0:2	2	1		100	0	100	3
9	HTM-901	Universal Human Values II : Understanding Harmony	3:0:0	3	3	75	25	0	100	3
10	PTS-203	Industrial Training-I	0:0:2	2	1		100	0	100	3
		Total	14:0:14	28	21.0	375	445	180	1000	

HTM-901	Universal Human Values II: Understanding Harmony						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3.0**	**75**	**25**	**100**	**3 Hours**
Purpose	Purpose and motivation for the course, recapitulation from Universal Human Values-I						
Course Outcomes (CO)							
CO 1	Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.						
CO 2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.						
CO 3	Strengthening of self-reflection.						
CO 4	Development of commitment and courage to act.						

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its contentand process; 'Natural Acceptance' and Experiential Validation- as the process for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment ofaspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at variouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrarinessin choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available tome. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-HumanRelationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the othersalient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- fromfamily to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value inrelationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence asCoexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" canbe used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on ProfessionalEthics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible

engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. todiscuss the conduct as an engineer or scientist etc.

READINGS:

Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J CKumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

MODE OF CONDUCT

Lecture hours are to be used for lecture/practice sessions.

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at handand motivating students to reflect, explore and verify them.

Practice hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elementsto help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions, the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Practice experiments are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based onbasic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacherpreparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemedessential.

ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by

faculty mentor: 5 marks

Self-assessment: 5 marks

Assessment by peers: 5 marks

Socially relevant project/Group Activities/Assignments: 10 marks

Semester End Examination: 75 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

BTE-401	Bioinformatics (B. Tech. Biotechnology Semester VII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To familiarize the students with the basics of Bioinformatics**						
Course Outcomes							
CO1	**Students will learn basic principles of various types of databases**						
CO2	**Students will come to know about various tools related to sequence alignment and statistical significance of alignment**						
CO3	**This unit will enable the students to learn various software tools for sequence analysis and primer designing**						
CO4	**Students will be able to learn predictive methods for nucleotides and protein sequence analysis**						

UNIT I

1. Databases

a. Sequence Databases: introduction of Databases, primary and secondary databases, nucleotide and protein sequence databases: Genbank, EMBL, DDBJ, Swissprot, pfam, Block, PRI

b. Structure Databases: Introduction to structures. PDB (Protein Data bank) Molecular Modeling database at NCBI. , visualizing structural information, database structure viewers.

c. Sequence and Structure File Formats

2. The Entrez system: Integrated information axis, Information retrieval from biological database, sequence database beyond NCBI. Medical databases.

UNIT II

3. Sequence Alignment AND Database Searches

Introduction, the evolutionary basis of sequence alignment, Type of Aligmnents, Pair-wise Alignment, Multiple Alignment, The modular nature of proteins, Optimal alignment methods, substitution scores and gap penalties, statistical significance of alignment. FASTA, BLAST, low-complexity regions, repetitive elements, Tool of multiple sequence alignment: CLUSTAL W/X, progressive alignment method.

4. Phylogenetic Analysis:

Elements of phylogenetic models, phylogenetic data analysis: alignment, substitution model building, tree building and tree evaluation, building the data model (alignment), determining the substitution model, tree- building methods, searching for trees, rooting trees, evaluation trees and data, phylogenic software (PHYLIP). Phylogenetic online

tool.

UNIT III

Sequence Analysis Using Software Resources:

Introduction. The Wisconsin package, the Seq Lab environment, analyzing sequences with operations and Wisconsin package programmes, viewing output, monitoring programme progress and troubleshooting problems, annotating sequences and graphically displaying annotations in the Seqlab Editor, saving sequences in the Seq Lab Editor, Example of analysis that can be undertaken in Seqlab, extending Seqlab by including programmes that are not part of the Wiscosin package.

Plasmid Mapping and Primer Design

Restriction mapping, Mac Vector and OMIGA. Gene construction kit. Vector NTI, primer design for PCR Sequencing, primer design programs and software.

UNIT IV

Predictive Methods using nucleotide sequences: Predictive methods using nucleotide sequences: Introduction, Gene prediction methods, Computational gene prediction in eukaryotes. Gene prediction programs: GRAIL, GeneID, GENSCAN, GENMARK, detecting functional sites in the DNA: Promoters, Intron Splice Sites, and Translation Initition Site.

Predictive methods using protein sequences: protein identity based on composition, physical properties based on sequence, secondary structure and folding classes, specialized structures or features, tertiary structure. Prediction of protein secondary and tertiary structures. Related software.

Reference/Text Books-

Bioinformatics by Andreas D.Boxevanis. Wiley Interscience, 4th edition 2020.

Bioinformatics: Sequence and genome analysis by David W.Mount, Cold Spring Harbor, 2004.

Biocomputing Informatics And The Genome Projects by Smith D.W., Academic Press, 2014.

Bioinformatics: A Biologists Guide to Computing and the Internet. by Stuart M. Brown, NKU Medical Center, NY USA, 2000.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-403	Pharmaceutical Biotechnology (B.Tech. Biotechnology Semester VII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Major Test**	**Total**	**Time**
3	0	**-**	**3**	**25**	**75**	**100**	**3 Hrs**
Purpose	**To learn various aspects of pharmaceutical biotechnology**						
Course Outcomes							
CO1	**tudents will learn the procedure for discovery and development of drugs**						
CO2	**Students will be able to understand the metabolism of drug in the body and effects of drug on the human body**						
CO3	**Students will learn the basic concepts involved in the preparation of various drugs and their formulations**						
CO4	**Students will understand the management of different Life Style Diseases and know the procedure of Quality control and assurance.**						

UNIT-I

1. Introduction and Different Disciplines of Pharmacy

2. Historical Background and New Drug Discovery and Development – Preclinical and Clinical trials of drugs. Pharmacogenomics, Types of Drug receptors.

UNIT-II

3. Pharmacokinetics and Pharmacodynamics: Drug Bioavailability, Consideration in dosage form design, route of administration (oral, parental, inhalations, topical) Basic Principle of Drug Absorption, Distribution, Metabolism and Excretion.

4. Radiopharmaceuticals and **Nanopharmaceuticals**- Therapeutic applications of radioisotopes, Applications of Nano technology in Pharmaceuticals.

UNIT-III

5. Basic concepts involved in the preparations of different Drugs and their Dosage forms.Solid Dosage Forms- Tablets , Capsules, Powders , Semisolid Dosage Forms - Creams, Ointments, Pastes, lotions, Liquid Dosage Forms like Mixtures, Solutions, Emulsion, Ophthalmic etc.

6. Additives and Excipients used in drug formulations- Colors , flavours, sweeteners, binders, Disintegrating agents and other additives used in prescriptions.

UNIT- IV

7. **Management of Life style diseases** like obesity, diabetes, B.P., cholesterol heart stroke and cancer, joint problems etc**.** Neutraceuticals: Sources, Types, Potential Benefits, Role in prevention and control.

8. **Pharmaceutical products and their Types**

Laxatives, Analgesics, Antiseptics, Antacids, Antibiotics.

9**. Quality control and assurance**- GMP, GLP, ISO- 9000, validation and Drug Regulatory affairs

Reference/Text Books:

1. Principles of Medicinal Chemistry Vol. 1 Dr. S.S.Kadam, Dr. K.R. Mahadik, Dr. K.G.Bothara
2. Principles of Medicinal Chemistry Vol. 1 Dr. S.S.Kadam, Dr. K.R. Mahadik, Dr. K.G.Bothara
3. Pharmaceutical Dispensing.(2010) Pratibha Anand and Roop K. Khar. CBS Publishers and Distributors Pvt. Ltd.
4. R. M. Mehta, "*Dispensing Pharmacy*", Vallabh Prakashan, New Delhi.
5. Brahmankar, CBS Publishers.
6. Lipin Cott's Illustrated Reviews Pharmacology. Richard Maria, Pamela, Mary, Sheldon .
7. Cooper and Guunn's,*"Dispensing for Pharmaceutical Students",* CBS Publishers, Delhi
8. A Owunwonne, *"Hand Book of Radiopharmaceuticals",* Narosa Publishing House, New Delhi.
9. H C Ansel, *" Introduction to Pharmaceutical Dosage Forms",* K M Varghese& Co., Mumbai.
10. S.N.Pandeya: A Textbook of Inorganic Medicinal Chemistry, S.G.Publishers, Varanasi.
11. Clarke, E. C. G., "*Isolation and Identification of Drugs*", The Pharmaceutical Press, London

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BTE-411	Biosensor and Bioinstrumentation (B.Tech. Biotechnology Semester-VII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3**	**75**	**25**	**100**	**3Hrs**
Purpose	**To familiarize the students with basic and applied aspects of Biosensors and Bioinstrumentation**						
Course Outcomes							
CO1	**To familiarize with basic concepts of general properties of transducers and other analytical instruments**						
CO2	**Students will come to know about bioassay design and implementation and basic concepts of automation and robotics**						
CO3	**This unit will enable the students to learn about data retrieval, handling and integration of databases and basics of human cardiac and vascular system**						
CO4	**Students will be able to know the basic concepts and applications of various types of biosensors**						

UNIT – I

1. **Introduction:** Electrical quantities and units, functional elements of an instrumentation system, static and dynamic characteristics, principle of analog and digital meters, CRO, energy meters, time and frequency meters, multimeters.
2. **Transducers**: Classification, resistive strain gauges, RTD, LVDT, Piezoelectric transducers, Electromagnetic transducers, Optical transducers, Transducers for biomedical science and their applications.
3. **Analytical Instruments:** pH meters, radiometric devices, fluorescence spectrophotometers, chromatology (chromatographic techniques- GC and HPLC), electrophoresis, lab on a chip – related instrumentation, Validation, commissioning and maintenance of the above equipments.

UNIT-II

4. **Assay Technologies and Detection methods:** Introduction, bioassay design and implementation, radiometric assay, scintillation proximity assay, fluorescence methodology to cover all types of fluorescence measurements and instrumentation, Reporter gene assay applications. Bio-analytical applications.
5. **Automation and Robotics:** Introduction: management and services issues of a centralized robotics HTS (high throughput screening) core, flexible use of people and machines, Bar-code technology and a centralized database, factors for the successful integration of assays, equipment, robotics and software. Perspectives on scheduling.

UNIT-III

6. **Data retrival, handling and integration:** Database systems, systems integration, data management and tracking
7. **Cardiac and Vascular system:** Overview of cardiovascular system, types of blood pressure sensors, Lumped parameters modeling of a catheter- sensor/system, heart sounds, cardiac catheterization, indirect measurement of blood pressure, measuring blood flow rate, measuring blood volume, pacemakers, defibrillators, cardiac-assist devices and heart valves- related instrumentation of equipments and involved sensors.
8. **Respiratory system**: Modeling the respiratory system, measuring gas flow rate and lung volume, tests of respiratory mechanics, measuring gas concentration, tests of gas transport, ventilators, anesthesia machines- related instrumentation of equipments and involved sensors.

UNIT-IV

9. **Biosensors:** Introduction to biosensors: concepts and applications, biosensors for personal diabetes management, micro fabricated sensors and the commercial development of biosensors, electrochemical sensors, chemical fibrosensors, Ion-selective FETs, non-invasive blood-gas monitoring, blood-glucose sensors. Noninvasive biosensors in clinical analysis, Applications of biosensors based instruments to the bioprocess industry. Applications of biosensors to the environmental samples, Introduction to biochips and their application to genomics, BIA core- an optical biosensors

Reference Books

1. M. K.Sezgintürk. Commercial Biosensors and their applications: Clinical, Food and Beyond. Elsevier. 2020.
2. G. Dutta, A. Biswas and A. Chakrabarti. Modern Techniques in Biosensors: Detection Methods and Commercial Aspects. Springer. 2021.
3. Introduction to Bio-analytical Sensors by Alice J Cunningham New York, John Wiley, 1998.
4. Applied Biosensors by DolandL.Wise, 1989
5. Advances in Laboratory Automation – Robotics, Eds. J.R.Strimataitis and J.N. Little, Zymark Corporation, Hopkinton, MA 1991.
6. Instrument methods of analysis by H W Willard, L LMerrit, J A Dean and F ASttle. 6/e, East- West publishers. 1992.
7. Biosensors and their applications by C Yang Victor and TNgo That, Plenum Press NY, 2000

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BTE-413	DEC-I * Biochips and Microarray Technology (B. Tech. Biotechnology Semester VII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3.0**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**The purpose of this course is to familiarize the students with different array techniques**						
Course Outcomes							
CO1	**To familiarize with basic concepts of biochips and microarray technology**						
CO2	**Students will be able to understand about RNA and Protein Chips and electrical detection methods for microarrays**						
CO3	**This unit will enable the students to learn about applications of biochip technology in various fields**						
CO4	**Students will be able to know the commercial aspects of biochip technology and DNA computing**						

UNIT -1

1. **Introduction**: Basics of biochips and microarray technology, historical development of biochip technology .Why are Microarray important.

2. **Biochip and Microarray construction**: DNA microarrays, oligonuleotide, cDNA and genomics microarrays, microchip production technologies, megaclone technology for fluid microarray labels, microarray scanners./headers, microarray robotics. Microfluidics systems, chips and mass spectrometry.

UNIT- II

3. **Biochip and Microarray construction (Continued)**: Biochips, microarrays, Chromosome on a chip, tissue chip, RNA chip, Protein chip technology, glycochips, biochips assays, combination of microarray and biosensor technology, biochip versus gel-based methods, process flow for production and analysis of a chip, standardization of microarray analysis, bioinformatics and microarrays, integrated biochip system, evaluation of conventional microarray technology. Electrical detection methods for microarrays, SERS (Surface-Enhanced Raman spectroscopy)-based microarrays.

UNIT- III

4**. Applications of Biochip Technology:** Molecular diagnostics and pharmacogenomics, Application of microarray technology in drug discovery and development, Gene expression studies, use of DNA chip technology for drug safety, use of microchips for drug delivery,

biochips as neural prostheses, use of biochips in health care, use of microarrays in population genetics and epidemiology, use of microarray in forensics. DNA chip technology for water quality management, Bioagent chip, Application of microarray in the agro-industry, use of microarray in genetic disease monitoring, point of care (POC) applications.

UNIT -IV

5. **Commercial aspects of Biochip technology:**Markets for biochip technologies, commercial support for the development of biochips, government support for biochip development, business strategies and patent issues

6. **DNA Computing:** Introduction, junctions, other shapes, biochips and large-scale structures. Discussion of Robinson and Kallenbach's methods for designing DNA shapes, DNA cube. Computing with DNA, Electrical analogies for biological circuits. Challenges and future trends. Gene ontology and pathway analysis

Reference /Text Books-

1. Arun Jogota, "Microarray Data Analysis and Visualization", The Bay Press, 2001.
2. Ernst Wit and John McClure, "Statistics for Microarrays Design", Analysis and Inference, John Wiley & Sons, 2004.
3. Steen Knudsen, "Guide to analysis of DNA Microarray data", John Wiley & Sons, 2004.
4. Biochips and Microarrays-technology & Commercial Potential, Published by RCK Publishing, 2012.
5 DNA Arrays: Technology and Experimental strategies, Grigorenko (ed), CRC Press, 2002.
6. Microarray Analysis Mark Schena; J. Wiley & Sons (ed., New York), 2002.
7. Microarray Bioinformatics, Dov Stekel, Cambridge University Press, 2003.
8. Microarray Technology and Its Applications, Uwe R. Müller, Dan V. Nicolau, Springer, 2005.
9. DNA Microarrays: Current applications: Emanuele de Rinaldis, Armin Lahm,, Horizon Scientific Press, 2007.

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**** The students should select two Departmental Elective Courses (DEC-I)***

BTE-415	Enzyme Technology (B. Tech Biotechnology semester VII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3.0**	**75**	**25**	**100**	**3 Hrs**
Purpose	**To familiarise students about different aspects of enzyme technology**						
Course outcome: After completion of this course the students will be able							
CO1	**To articulate advantages and disadvantages of enzyme based production processes.**						
CO2	**To compare different strategies used for protein engineering**						
CO3	**To explain the principles and parameters used for enzyme immobilization.**						
CO4	**To differentiate between solid state fermentation and submerged fermentation.**						

UNIT I

Introduction to enzyme Technology: What are Biocatalysts? Bio- and Chemo catalysts – Similarities and Differences, Goals and Potential of Biotechnological Production Processes, The Use of Isolated or Intracellular

Enzymes as Biocatalysts, Advantages and Disadvantages of Enzyme-Based Production Processes, Goals and Essential System Properties for New or Improved Enzyme Processes, Essential System Properties for Rational Design of an Enzyme Process , Current Use and Potential of Enzyme Technology

UNIT-II

Enzyme Discovery and Protein Engineering: Enzyme Discovery, Strategies for Protein Engineering, Rational Protein Design, Directed (Molecular) Evolution

Methods to Create Mutant Libraries, Assay Systems, Focused Directed Evolution, Computational Design of Enzymes

UNIT-III

Immobilization of Enzymes: Principles, Parameters of Immobilization, Carriers

Inorganic Carriers, Polysaccharides, Synthetic Polymers, Binding Methods

Adsorption, Covalent Binding, Application of Immobilized Enzymes

Hydrolysis and Biotransformation of Carbohydrates, Amino Acid, Peptide Synthesis, Application of Lipases

UNIT-IV

Enzyme production and Purification: solid state fermentation, submerged fermentation, environmental factors affecting microbial enzyme production in SSF. Strategies to improve production of microbial cellulase.

Reference/Text Books

1. Klaus Buchholz, Volker Kasche, and Uwe T. Bornscheuer "Biocatalysts and Enzyme Technology" 2nd Edition, Wiley-Blackwell, 2012
2. M.Y Khan and Farah Khan " Principles of enzyme technology" PHI, 2015
3. Enzyme Technologies editors: Hsiu-Chiung Yang Wu-Kuang Yeh and James R. McCarthy, Wiley, 2014
4. "Biotechnology of Microbial Enzymes" Editor Goutam Brahmachari, Academic Press, 2017

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-417	Advanced Management Information system and Information Technology (B. Tech Biotechnology semester VIII)						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	1	0	3	75	25	100	3 Hour
Purpose	To familiarize the students with Management Information System.						
Course Outcomes After completion of this course the students will be able							
CO1	To Understand and articulate fundamental concepts of information technology management.						
CO2	To Assess and apply IT to solve common business problems.						
CO3	To Suggest and defend effective solutions to business problems, and design a database application to solve a business problem.						
CO4	To Discuss the ethical aspects of information technology use in the organization and its governance issues.						

UNIT I

Introduction: Definition information system, role and impact of MIS, The challenges of Information system, Nature of
MIS, Characteristics of MIS, Myths regarding MIS, Requirements of MIS, Problems & Solutions in implementing MIS, Benefits of MIS, Limitations of MIS, Significance of MIS, Components of MIS. Role of MIS, Major Management challenge to building and using information system in Organization, functions of management.

UNIT II

Information system and Organizations: The relationship between Organization and Information System, Information needs of different organization levels: Information concept as quality product, classification and value of information, methods of data and information collection. Strategic role of information system, Salient features of Organization, Information, management and decision making, How Organization affect Information Systems, How Information system affect Organization, Ethical and Social impact of information system.

UNIT III

Business application of Information System: Foundation Concepts Information systems in Business: Information system and technology, Business Applications, Development and Management. The internetworked E-business Enterprise: Internet, and Extranet in business. Electronic Commerce System: Electronics commerce Fundamentals, Commerce Application and issues. E-business Decision Support: Decision support in E-Business, Artificial Intelligence Technologies in business.

UNIT IV

Strategic and Managerial Implications of Information Systems: Strategic Information System: Introduction, Characteristics of Strategic Information Systems, Strategic Information Systems (SISP), Strategies for developing an SIS, Potential Barriers to developing a Strategic Information System (SIS), Decision Support System (DSS): Decision making concepts, methods, tools and procedures. Managing Information Resources: Introduction, IRM, Principal of Managing Information Resources, IRM functions, Computer Security: Introduction, Computer Security, Types of Computer Security, Disaster Recovery Plan.

Reference/Text Books:

1. W.S . Jawadakar, “Management Information System”, McGraw Hill ,
2. J. O. Brien, “ Management Information System”, TMH, New Delhi
3. Uma G . Gupta, “Management Information System” Fifth Edition TMH.
4. Kenneth C. Laudon, “Management Information System Organisation and Technology” TMH.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-419	Stem Cell Technology (B.Tech. Biotechnology) Semester- VII						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**0**	**3**	**75**	**25**	**100**	**3**
Purpose	**The objective of this course is to enable students to understand the principles of stem cells, their isolation and maintenance and their application in different therapies**						
Course Outcomes							
CO1	**Students will be able to differentiate among the different types of stem cells**						
CO2	**Students will be able to explain the concept of stem cell cloning**						
CO3	**Students will be able to compare the isolation and maintenance methods for different type of stem cells**						
CO4	**Students will be able to recognize the applications of stem cells in different diseases**						

UNIT I

Introduction: Basic concepts and properties of Stem cells, Totipotency and Pluripotency, Types of stem cells: Embryonic stem cells, germinal stem cells, Adult stem cells, Tumor stem cells.

UNIT II

Molecular Cell Biology and Cloning: Molecular mechanisms, Cell cycle regulation in stem cells. Stem cell niches, Stem cell lineage tracing

Therapeutic and reproductive cloning, Nuclear Transfer method, Application of nuclear transfer derived embryonic stem cells.

UNIT III

Stem Cells maintenance and transplant: Sources of stem cells; Cell types for transplantation: Bone marrow, Peripheral stem cells, cord blood stem cells

General methods of Isolation, Identification, Characterization and maintenance of different stem cells: Embryonic stem (ES) cells, Hematopoietic Stem Cells (HSC), Hematopoietic Stem Cells (HSC), Differentiation studies of Mesenchymal stem cells, Neural stem cell and Neural crest stem cell.

UNIT IV

Stem cells and Therapy Cell based therapy, organ factories, drug discovery and development, Medical applications in Leukemia, Immune deficiencies, diabetes, liver diseases, cardiovascular diseases, Neurological disorders

Reference/Text Books

1. Anthony Atala, Robert Lanza. Essentials of Stem Cell Biology. Netherlands: Elsevier/Academic Press, 2014.

2. Atala A & Lanza R, Stem Cells Handbook. Netherlands: Springer New York, 2013.

3. Satish Totey and Kaushik D. Deb. Stem Cell Technologies: Basics and Applications (McGraw-Hill, 2010).

4. Robert A. Meyers Stem Cells: From Biology to Therapy (Current Topics from the Encyclopedia of Molecular Cell Biology and Molecular Medicine), 2013

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-421	Herbal Drug Technology (B. Tech. Biotechnology Semester VII)						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
2	1	0	3	75	25	100	3 Hrs.
Purpose	To familiarize the students with basic and applied aspects of Herbal Drug Technology						
Course Outcomes							
CO1	The contents of first unit will enhance the knowledge of students about traditional herbs and herbal medicine.						
CO2	Students will come to know about the basic concepts of various systems of medicine and traditional therapies						
CO3	This unit will learn the skills about technology for production of crude drugs.						
CO4	To familiarize with basic knowledge of use of herbs in the management of health. Students will learn about the economic aspects of herbs and herbal drugs						

UNIT I

Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, Common herbals and herbal medicines of India. Sources of Herbs Selection, Identification and authentication of herbal materials. The need for the study of herbs and herbal medicine.

UNIT II

Systems of Medicine : Evolution of systems of medicine, Traditional Therapies and Types of therapies– Ayurveda , Unani, eight chikitsas , eight chakras, Naturopathy, Homeopathy, Aromotherapy, Faith healing, Religious beliefs and Ethnotherapeutics . Concept of Holistic medicine. Ayurvedic Pharmacopoeia of India.

UNIT III

Technology for production of crude drugs: Herbal drug preparation. Processing of herbal raw material, Principles of extraction and different methods of extraction. Formulation and Standardization of herbal extracts. Stabilization and stability of herbal formulations.

UNIT IV

Health Benefits: Evolution of conscious use of plants in the management of health and disease General aspects, scope and types of products available in the market. Health benefits and role of herbs in ailments like Diabetes, CVS diseases, Cancer, and various Gastro intestinal diseases. Role of herbs in cosmetics.

Economic Aspects of Herbal Drugs: Economic value of herbs and herbal drugs, Databases on herbals and herbal drugs. Rescue and Preservation of traditional medicinal knowledge and herbals. Development of herbal medicine industry- Present Scope and future prospects.

Reference Books-

1. A lexicon of medicinal plants in India. D.N.Guhabakshi, P.Sensarma and D.C.Pal, 1999.Naya prakash - publications.
2. Glossary of Indian medicinal plants. R.N.Chopra, S.L.Nayar and I.C.Chopra,1956. C.S.I.R, New Delhi.
3. Ethnobotany The Renaissance of Traditional Herbal Medicine. Rajiv K. Sinha, 1996.Ina Shree publishers.
4. The indigenous drugs of India. Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
5. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
6. New Natural products and Plant drugs with Pharmacological, Biological (or) Therapeutical activity. H.Wagner and P.Wolff , 1979. Springer, New Delhi.
7. Ayurvedic drugs and their plant source. V.V.Sivarajan and Balachandran Indra, 1994. Oxford IBH publishing Co.
8. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1988. Banarsidass, Delhi.
9. Principles of Ayurveda. Anne Green, 2000. Thorsons, London.
10. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
11. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

**** The students should select two Departmental Elective Courses (DEC-I)***

BTE-405	BIOINFORMATICS LAB (B.Tech. Biotechnology Semester VII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test (Practical)**	**Minor Test**	**Total**	**Time**
-	**-**	**3**	**1.5**	**60**	**40**	**100**	**3 Hrs.**
Purpose	**To familiarize the students with applied aspects of Bioinformatics**						
Course Outcomes							
CO1	**To familiarize with computer basics and searching of biological databases**						
CO2	**Students will come to know about data mining techniques**						
CO3	**To learn the concepts of phylogenetic analysis using bioinformatics software**						
CO4	**Students will be able to know the basic concepts of protein structure prediction**						

List of Experiments:

1. Computer basics
2. Searching biological database for relevant information
3. Data mining techniques in Bioinformatics.
4. Searching, retrieval and similarity analysis of biological database.
5. Sequence retrieval from nucleic acid and protein database.
6. Restriction mapping
7. Sequence (FASTA & BLAST) searches.
8. Pair wise comparison of sequences.
9. Evolutionary studies/ Phylogenic analysis.
10. Identification of genes in genomes.
11. Protein databank retrieval and visualization.
12. Superposition of structures.
13. Secondary structure prediction of proteins.
14. Pattern searching in nucleic acids.
15. Validation of 3D structures.

Reference/Text Books-

Bioinformatics- A Practical Guide to the Analysis of Genes and Proteins by Andreas D. Baxevanis and B.F.Francis Ouellette, 4th Edition, A John Wiley and Sons, Inc. Publications, 2020.

Bioinformatics: Sequence and Genome Analysis by David W. Mount, Cold Spring

Harbor, 2004.

Biocomputing Informatics and the Genome Projects by Smith D.W., Academic Press,

BTE-402	**Biocatalysis & Biotransformation (B.Tech. Biotechnology Semester VIII)**						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**-**	**3.0**	**75**	**25**	**100**	**3 Hrs**
Purpose	**To familiarize the students with Concepts of Biocatalysis and Biotransformation**						
Course outcome	**After completion of this course the students will be able**						
CO1	**To articulate the concept of Biocatalysis and Biotransformation.**						
CO2	**To differentiate between different strategies for production of succinic acid.**						
CO3	**To explain the mechanism of pesticide transformation.**						
CO4	**To compare computational tools for enzyme function prediction.**						

2014.

UNIT I

1. **Introduction to biocatalysis**, Current market of biocatalysis, fermentation, concept of biotransformation and advantages and limitations of biotransformation.
2. Development of chemo enzymatic processes: synthetic route design and integration of biocatalysis, chemo-enzymatic process development

UNIT II

4. **Production of Dicarboxylic Acid Using Yeasts**: Current Uses and Production of Dicarboxylic Acids, Selection and Improvement of Yeast Strains, Selection and Improvement of Yeast Strains, Metabolic Engineering Strategies for Biotechnological Production of Succinic Acid
5. **Engineering Proteases for Industrial Applications**: Proteases in Industry, Serine Proteases and Subtilisins, Engineering Subtilisin Protease toward Increased Oxidative Resistance, Increasing Protease Tolerance against Chaotropic Agents.

UNIT III

6. **Transformation of pesticides**: Accumulation of pesticide, Mechanism of pesticide transformation, enzymatic reactions in pesticide metabolism
7. Transaminases: Transaminases as a Biosynthetic Route for Chiral Amines, Kinetic Resolution of Amines Employing ATAs, Recent Advances in Industrially Relevant Asymmetric Reductive Amination Reactions, ATA Screening Kit

UNIT IV

8. **Structural Bioinformatics and Biocatalysis Research**: Computational Tools for Function Prediction and Analysis of Enzymes.
9. **Recent development in biotransformation**: current challenges and future scopes of biotransformation process, practical consideration for enhancing efficiency of biotransformation

Reference/text books

1. Green Biocatalysis edited by Ramesh N. Patel, John Wiley and Sons, 2016.
2. Biotransformation of Agricultural Waste and By-Products edited by Palmiro Poltronieri and Oscar Fernando D'Urso, Elsevier Inc, 2016
3. Applied Biocatalysis edited by Lutz Hilterhaus, Andreas Liese, Ulrich Kettling, and Garabed Antranikian, Wiley-VCH, 2016.
4. Journal of Biocatalysis and Biotransformation.

Note: The Examiner will be given the question paper template and will have to set

BTE-404	Metagenomics (B.Tech. Biotechnology Semester- VIII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3.0**	**75**	**25**	**100**	**3Hr**
Purpose	**The purpose of this course is to provide focus on next generation DNA sequencing technology and p how the metabolic functions, taxonomic distribution, diversity, evenness and species richness of microbial communities varies across environment**						
Course Outcomes							
CO1	**Students will become familiar with Metagenomics**						
CO2	**Students will be able to perform the phylogenetic tree**						
CO3	**Students will develop the knowledge and able to perform Metagenomic analysis of soil microbial communities**						
CO4	**Students will develop focus on the application of metagenomics**						

the question paper according to the template provided along with the syllabus.

UNIT -1

What is metagenomics; Types of metagenomes: Amplicon, Shotgun, Functional; Amplicon metagenomics: History, phylogenetic marker, examples; Shotgun metagenomics: History and examples. Techniques subtractive hybridization (SSH); Differential expression analysis (DEA); Microarrays & Metagenome sequencing

UNIT- II

Direct linking of microbial populations to specific biodegradation and biotransformation processes by stable isotope probing of biomarkers- PhyloChip & GeoChip-Detection of xenobiotic-degrading bacteria by using oligonucleotide microarrays

Phylogenetic analysis and Comparative genomics Software's & Tools and Construction of a metagenomic library; Analysis of Metagenomic Libraries; Sequence-based Metagenomics Analysis; Function-based Metagenomics Analysis

UNIT -III

Metagenomic analysis of soil microbial communities; Metagenomic analysis of marine microbial communities; Metagenome of the Microbial Community in Acid Mine Drainage; Metagenomic Analysis of Bacteriophage; Metagenomics and Its Applications to the Study of the Human Microbiome; Archaeal Metagenomics: Bioprospecting Novel Genes and Exploring New Concepts.

UNIT -V

Application of Metagenomics to Bioremediation; Applications of Metagenomics for Industrial Bioproducts; Escherichia coli host engineering for efficient metagenomic enzyme discovery; Next-generation sequencing approaches to metagenomics; Stable isotope probing: uses in metagenomics; DNA sequencing of uncultured microbes from single cells.

Reference/Text Books

8. Diana Marco Universidad Nacional de Cordoba, Argentina, "*Metagenomics: Theory, Methods and Applications"*, Caister Academic Press,2010.
9. Diana Marco Universidad Nacional de Cordoba, Argentina "*Metagenomics: Current Innovations and Future Trends"*,Caister Academic Press,2011.
10. Joanna R. Freeland, Heather Kirk, Stephen Petersen, "*Molecular Ecology*", Mc Graw Hill, 2nd Edition "2012.
11. Beebee T.J.C., D G. Rowe," *An Introduction to Molecular Ecology*", Mc Graw Hill, 2004.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-406	Molecular Modelling and Drug Design (B.Tech. Biotechnology Semester VIII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3**	**75**	**25**	**100**	**3Hrs**
Purpose	**The course will focus on the Molecular Modelling in context of drug designing**						
Course Outcomes							
CO1	**To understand the critical relationship among biomolecular structure, function and force field models.**						
CO2	**To be able to utilize basic modelling techniques to explore biological phenomena at the molecular level.**						
CO3	**To emphasize Modelling drug/receptor interactions in detail by molecular mechanics, molecular dynamics simulations and homology modelling.**						
CO4	**An awareness of rational drug design, based on understanding the three-dimensional structures and physicochemical properties of drugs and receptors will be created.**						

UNIT I

1. **Introduction to Molecular Modelling**: Introduction - Useful Concepts in Molecular Modelling: Coordinate Systems. Potential Energy Surfaces. Molecular Graphics. Surfaces. Computer Hardware and Software. The Molecular Modelling Literature.

UNIT II

2. **Force Fields: Fields. Bond Stretching**. Angle Bending. Introduction to Non-bonded Interactions. Electrostatic Interactions. Van der Waals Interactions. Hydrogen Bonding in Molecular Mechanics. Force Field Models for the Simulation of Liquid Water.

UNIT III

3. **Energy Minimisation and Computer Simulation**: Minimisation and Related Methods for Exploring the Energy Surface. Non-Derivative method, 1st and 2nd order minimisation methods. Computer Simulation Methods. Simple Thermodynamic Properties and Phase Space. Boundaries. Analyzing the Results of a Simulation and Estimating Errors. GROMACS and CNS.

UNIT IV

4. **Molecular Dynamics & Monte Carlo Simulation**: Molecular Dynamics Simulation Methods. Molecular Dynamics Using Simple Models. Molecular Dynamics with Continuous Potentials. Molecular Dynamics at Constant Temperature and Pressure. Metropolis Method. Monte Carlo Simulation of Molecules. Models Used in Monte Carlo Simulations of Polymers. Molecular Modeling software: BIOSUITE
5. **Structure Prediction and Drug Design**: Structure Prediction - Introduction to Comparative Modeling. Sequence Alignment. Constructing and Evaluating a Comparative Model. Predicting Protein Structures by 'Threading', Molecular Docking, AUTODOCK and HEX. Structure based De Novo Ligand design, Drug Discovery – Chemoinformatics – QSAR.

Reference/Text Books

1. S. Ramasamy. Molecular Modeling. Lambert Academic Publishing, USA. 2015
2. V. Magnasco. Methods of Molecular Quantum Mechanics- An Introduction to Electronic Molecular Structure. Wiley. 2009
3. A.R.Leach, Molecular Modelling Principles and Application, Longman, 2001.
4. J.M.Haile, Molecular Dynamics Simulation Elementary Methods, John Wiley and Sons, 1997.
5. S. P. Gupta. QSAR and Molecular Modeling, Springer - Anamaya Publishers, 2008.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-408	Cancer Biology (B.Tech. Biotechnology) Semester- VIII						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**0**	**3**	**75**	**25**	**100**	**3**
Purpose	**To give complete overview of cancer as a disease detailed analysis of biological changes of the tumor cells. Analyze the impact of the cell cycle (proliferation), gene mutations and apoptosis in cancer. Discuss the impact of applied/translational research in cancer diagnosis as well as the design of novel targeted therapeutic agents in the treatment of cancer.**						
Course Outcomes							
CO1	**Students will be able to categorize the different forms of cancer**						
CO2	**Students will be able to explain the genetic basis of cancer**						
CO3	**Students will be able to recognize the role of different proteins in cancer and their clinical significance**						
CO4	**Students will be able to assess/compare different diagnostic and therapy methods**						

UNIT I

Fundamentals of Cancer Biology and Principles of Carcinogenesis

Overview of the hallmarks of cancer, Different forms of cancers, Diet and cancer, Natural history of Carcinogenesis, Chemical Carcinogenesis, Metabolism of Carcinogenesis, Principles of Physical Carcinogenesis, X - Ray radiation - mechanism of radiation Carcinogenesis.

UNIT II

Molecular Cell Biology of Cancer: Tumor viruses and Oncogenes, Identification of Oncogenes, Mechanism of oncogene activation, Role of growth factors and receptors in carcinogenesis, RAS signaling in cancer

Regulation of Cell cycle, modulation of cell cycle in cancer, Tumor suppressor genes, pRb tumor suppressor, Apoptosis and p53 tumor suppressor

UNIT III

Principles of Cancer Metastasis: Three-step theory of Invasion, Proteinases and tumour cell, Basement Membrane disruption, The biology of angiogenesis, Metastatic cascade

UNIT IV

Detection of Cancer and Cancer Therapy: Fundamental principles behind cancer diagnosis, Advances in Cancer detection, Different forms of therapy: Chemotherapy, radiation Therapy, and Immuno therapy, Applications of omics technologies in diagnostics and treatment.

Reference/Text Books

5. Pecorino, Lauren. Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics. United Kingdom: Oxford University Press, 2016.

6. Weinberg, Robert Allan. The Biology of Cancer. United Kingdom: Garland Science, 2014.

7. Vincent T. DeVita Jr. MD, Theodore S. Lawrence, Steven A. Rosenberg Cancer: Principles and Practice of Oncology Primer of Molecular Biology in Cancer(3rd edition)

4 Oxford Textbook of Cancer Biology, edited by Pezzella, Francesco, Mahvash Tavassoli, and David J. Kerr. Oxford, UK: Oxford University Press, 2019-05. https://oxfordmedicine.com/view/10.1093/med/9780198779452.001.0001/med-9780198779452.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-410	Developmental Biology (B. Tech. Biotechnology) Semester- VIII						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3.0**	**75**	**25**	**100**	**3h**
Purpose	**This course will help the students to understand the basic knowledge of morphogenesis and organogenesis in plants and animals.**						
Course Outcomes							
CO1	**Students will be able to illustrate the basic concept of development.**						
CO2	**Students will be able to classify Gametogenesis between plant and animal.**						
CO3	**Students will be able to develop the knowledge of morphogenesis in animals.**						
CO4	**Students will be able to develop the knowledge of morphogenesis in plants.**						

UNIT -1

Basic concepts of development : Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.

UNIT- II

Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.

Unit –III

Morphogenesis and organogenesis in animals : Cell aggregation and differentiation in *Dictyostelium*; axes and pattern formation in Drosophila, amphibia and chick, organogenesis – vulva formation in *Caenorhabditis elegans*, eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.

UNIT –IV

Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum. Programmed cell death, aging and senescence.

Reference/Text Books

1. Developmental Biology by Gilbert SF and Sunderland MA. 6th Edition, 2000.
2. Abu-Shaar M, Mann R S. Generation of multiple antagonistic domains along the proximodistal axis during *Drosophila* leg development. Development. 1998.
3. The Biology of Aging by Sinauer Associates, Sunderland, MA *2nd Ed 1998.*

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-412	Protein Engineering* (B.Tech. Biotechnology Semester VIII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**-**	**3.0**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To create awareness with concepts of protein engineering**						
Course Outcomes: After completion of this course the students will be able							
CO1	**To differentiate between secondary and tertiary structures of protein**						
CO2	**To demonstrate structure function relationship of membrane proteins**						
CO3	**To explain the concept of designed protein**						
CO4	**To identify protein- protein interactions.**						

UNIT I

1. **Structure Function Dynamics Correlation**. Basic structural concepts – Primary, secondary, tertiary and quaternary structures. Ramachandran plot, super secondary structures – motif and domain. Protein folding and mechanisms.

UNIT II

2. **Structure Function Engineering**. The correlation of structure and function in – transcription factors, serine proteinases, membrane proteins, signal transduction proteins and recognition in immune system.

UNIT III

3. **Library Construction for Protein Engineering**: Established methods for library construction, critical methods in evaluation of library construction methods. Designed proteins, examples of designed proteins (enzymes) with enhanced stability and efficiency, playing a significant role in industries.

UNIT IV

4. **Engineering of Therapeutic Proteins**: Sources of Protein Therapeutics, Strategies for Designing Effective Protein Therapeutics, Examples of Protein Therapeutics
5. **Proteomics Application**. Mining proteomes, protein expression profiling, identifying protein – protein Interactions and protein complexes, mapping- protein identification, new directions in proteomics.

References/Text Books

1. Amit Kessel and Nir Ben-Tal, "Introduction to Protein" 2nd Edition, Chapman and Hall, 2018
2. Anton Torres Editor "Protein Engineering and Design," Syrawood Publishing House, 2017
3. Daniel C. Liebler, "Introduction to Proteomics – Tools for the New Biology," Humana Press, 2001
4. Protein Engineering and Design edited by Sheldon J. Park Jennifer R. Cochran, CRC Press, 2010

5 M.Romya and P. Ponmurugan, Protein Engineering, Narosa Publications, New Delhi, 2015

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BTE-414	Bioethics, IPR and Biosafety (B. Tech. Biotechnology) Semester- VIII						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
2	**1**	**0**	**3**	**75**	**25**	**100**	**3hrs**
Program Objective (PO)	Students will able to acquire knowledge of regulatory bodies ,acts and organization indulge in creating a balancing force between advent in technology with monitoring their impacts on human and ecology alongwith biosafety measures with ethical conduct to society.						
Course Outcomes							
CO1	Students will be able to describe the basic terms and procedure for IPR, patent filing and implications on society of commercialized products.						
CO2	Students will be able to learn and describe various act, policies, different organizations and guidelines for biosafety.						
CO3	Students will develop knowledge of outbreak and risk assessment and management at laboratory level along with health impacts.						
CO4	Students will develop awareness of ecological impact of release of genetically modified organisms and monitoring methods.						

UNIT -1

Introduction- Intellectual Property Rights, Copyrights, Trademarks, Trade secrets, Geographical indications, Patents, Patent Filing, Indian Patent act and amendments, Implications of intellectual property rights on the commercialization of Biotechnology products, Patented products in Market and Success story.

UNIT- II

Policies, Agreements and Organization -National biosafety policies and law, The Cartagena protocol on biosafety, Convention on biological diversity, Cross border movement of germplasm and agreements, World Trade Organization and agreements, Updated Regulatory frameworks.

UNIT-III

Biological Containment- Risk assessment, Risk management, General principal for biological containment at laboratory level, Health impact of containment issues-Allergenicity, Antibiotic resistance and Toxicology. Case studies.

UNIT –IV

Ecological Impacts-Genetically Modified organism and impact on biodiversity, gene flow, gene escape and creation of superweeds/ superviruses, Monitoring strategies and method of detecting transgenics(Radioactive /Non radioactive methods).Case studies.

Reference/Text Books

1. Padma Nambisan, An introduction to ethical safety and intellectual property rights issues in biotechnology, Academic Press,ISBN-978-0-12-809231-6, 2017.
2. Deepa Goel and Shomini Parashar, IPR, Biosafety and Bioethics, Pearson Education,India,ISBN-978933251429,2013.
3. V. Sree Krishna, Bioethics and Biosafety in Biotechnology, New age international private ltd., 2007.
4. Gerald A. Urban, BioMEMS, Springer, 2010.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

OEC-BT-418	Biomedical Electronics (B. Tech Biotechnology semester VIII)							
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Practical**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**-**	**100**	**3**
Course Outcomes **At the end of this course students will demonstrate the ability to**								
CO1	**Understand and explain the concept of biomedical signals, electrodes and instrumentation**							
CO2	**Understand and explain the physiological transducers and recording systems**							
CO3	**Understand and explain biomedical recorders and patient monitoring systems**							
CO4	**Understand and explain cardiac pacemakers, defibrillator and patient safety**							

UNIT-I

Introduction: Role of technology in medicine, physiological systems of the body, sources of biomedical signals, basic medical instrumentation and their performance requirements, intelligent medical instrumentation systems, consumer and portable medical equipment, implantable medical devices, role of engineers in healthcare facilities.

Bioelectric Signals and Electrodes: Origin of bioelectric signals, recording electrodes, silver- silver chloride electrodes, electrodes for ECG, electrodes for EMG, electrical conductivity of electrode jellies and creams, microelectrodes.

UNIT-II

Physiological Transducers: Definition, classification and performance characteristics of transducers, displacement, position and motion transducers, pressure transducers, transducers for body temperature measurement, photoelectric transducers, optical fiber sensors, biosensors, smart sensors.

Recording System: Basic recording system, general considerations for signal conditioners, preamplifiers, sources of noise in low level measurements, biomedical signal analysis and processing techniques, the main amplifier and driver stage, writing systems.

UNIT-III

Biomedical Recorders: Electrocardiograph, vectorcardiograph (Vcg), phonocardiograph (Pcg), digital stethoscope, electroencephalograph (Eeg), electromyograph.

Patient Monitoring Systems: System concepts, cardiac monitor, bedside patient monitoring systems, central monitors, measurement of heart rate, measurement of temperature, measurement of respiration rate, catheterization laboratory instrumentation, ambulatory monitoring instruments.

UNIT-IV

Cardiac Pacemakers and Defibrillators: Need for cardiac pacemaker and defibrillator, external pacemakers, implantable pacemakers, pacing system analyzer, DC defibrillator, implantable defibrillators, types of defibrillators, defibrillator analyzer.

Patient Safety: Electric shock hazards, leakage currents, safety codes for electromedical equipment, electrical safety analyzer.

Text/Reference Books:

1. R S Khandpur: Handbook of biomedical instrumentation, 3rd ed., McGraw Hill Education.
2. Joseph D. Bronzino: The biomedical engineering handbook, 2nd ed., CRC Press.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

OEC-BT-420	Matlab&Simulation (B.Tech Biotechnology Semester VIII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**-**	**3**	**75**	**25**	**100**	**3 Hrs.**
Course Outcomes (CO) At the end of the course students will be able to							
CO1	**Write basic commands and script files in MATLAB**						
CO2	**Solve mathematical equations**						
CO3	**Create 2D and 3D analysis plots**						
CO4	**Design Simulink models**						

UNIT I

Introduction to MATLAB: Introduction to MATLAB software, Key features, MATLAB window, Command window, Workspace, Command history, Setting directory, Working with the MATLAB user interface, Basic commands, Assigning variables, Operations with variables. Working with script tools, Writing Script file, Executing script files, The MATLAB Editor, Saving m files. Introduction to Graphical User Interface (GUI).

UNIT II

Matrix and Data files: Character and string, Arrays and vectors, Column vectors, Row vectors, Basic Mathematics, BODMAS Rules, Arithmetic operations, Operators and special characters, Mathematical and logical operators, Solving arithmetic equations, Operations on matrix, Crating rows and columns Matrix, Matrix operations, Finding transpose, determinant and inverse, Solving matrix, Trigonometric functions, Complex functions. Writing user defined functions.

UNIT III

2D and 3D Plots: Plots: Plotting vector and matrix data, Plot labelling, curve labelling and editing, 2D Plots: Basic Plotting Functions, Creating a Plot, Plotting Multiple Data Sets in One Graph, Specifying Line Styles and Colors, Graphing Imaginary and Complex Data, Figure Windows, Displaying Multiple Plots in One Figure, Controlling the Axes, 3D Plots: Creating Mesh and Surface, About Mesh and Surface Visualizing, Subplots.

UNIT IV

MATLAB Programming and Simulink: Automating commands with scripts, Writing programs with logic and flow control, Writing functions, Control statement Programming, Conditional Statement Programming, Control Flow Conditional Control — if, else, switch, Loop Control — for, while, continue, break, Program Termination — return. Introduction to Simulink, Simulink Environment & Interface, Study of Library, Circuit Oriented Design, Equation Oriented Design, Model, Subsystem Design, Connect Call back to subsystem, Application.

Text and Reference Books/Material:

1. Marvin Marcus, Matrices and MATLAB: A Tutorial, Prentice Hall , 2010
2. MATLAB Primer by MATHWORKS: http://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

OEC-BT-422	History of Science (B.Tech Biotechnology semester VIII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**-**	**3.0**	**75**	**25**	**100**	**3 Hr**
Purpose	**The purpose of this course is to aware the students about development of science in India**						
Course outcome : After completion of this course the students will be able							
CO 1	**To articulate the scope and importance of science and technology in development of society.**						
CO2	**To appreciate the development of science and technology in Ancient India.**						
CO3	**To explain the development of science and technology in Medieval India.**						
CO4	**To appreciate the Policy development in the field of science and Technology.**						

UNIT-I

Concepts and Perspectives: Meaning of History Objectivity, Determinism, Relativism, Causation, Generalization in History; Extent of subjectivity, contrast with physical sciences, interpretation and speculation, concept of historical inevitability, Historical Positivism.

Science and Technology-Meaning, Scope and Importance, Interaction of science, technology & society, Sources of history on science and technology in India.

UNIT-II

Science and Technology in Ancient India: Technology in pre-historic period, beginning of agriculture and its impact on technology, Science and Technology during Vedic and Later Vedic times.

UNIT-III

Science and Technology in medieval India: Legacy of technology in Medieval India, Interactions with Arabs, Astronomy and Mathematics: interaction with Arabic Sciences, Science and Technology on the eve of British conquest

UNIT-IV

Science and Technology in a post-independent India: Science, Technology and Development discourse Shaping of the Science and Technology, Policy Developments in the field of Science and Technology, Social implications of new technologies like the Information Technology and Biotechnology

Reference/Text Books

1. M. Bhardwaj “History of science and Technology in Ancient India” Publisher Bookwin, 2010
2. Bal Ram Singh, Nath Girish and Umesh Kumar Singh “ Science and Technology in ancient Indian Text, D.K.Print world, 2012
3. Kamlesh Mohan “Science and Technology in Colonial India, Aakar Publisher, 2014

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

OEC-BT-424	Internet of Things (B.Tech. Biotechnology Semester VIII)						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**-**	**3.0**	**75**	**25**	**100**	**3 Hrs**
Purpose	**To familiarize students about basics of Internet of Things**						
Course Outcomes							
CO 1	**Understand what IoT technologies are used for today, and what is required in certain scenarios.**						
CO2	**Understand the types of technologies that are available and in use today and can be utilized to implement IoT solutions.**						
CO3	**Understand the type of protocols and challenges for designing IoT systems.**						
CO4	**Apply these technologies to tackle scenarios in teams of using an experimental platform for implementing prototypes and testing them as running applications. Understand operating system requirements of IOT.**						

UNIT 1

Introduction to IoT: Defining IoT, Characteristics of IoT, Functional blocks of IoT, Physical and logical design of IoT, Smart cities and IoT revolution, ,Difference between IoT and M2M, M2M and peer networking concepts Ipv4 and IPV6, Software Defined Networks SDN,

UNIT 2

Developing IoTs: IoT design methodology, case study on IoT system for weather monitoring. IoT system Management,

Developing IoT applications through embedded system platform: Introduction to sensors, IoT physical devices and endpoints, Raspberry pi, Raspberry pi interfaces, Arduino, arduino interfaces.

UNIT 3

Protocols for IoT- messaging protocols, transport protocols, Ipv4, Ipv6, URI, Cloud for IoT: IoT with cloud, challenges, introduction to fog computing, cloud computing,

Challenges in IoT: Design challenges, development challenges, security and legal considerations.

UNIT 4

Logic design using Python: Introduction to python, data types, data structures, control flow, functions, modules, file handling and classes., implementing IotT concepts with python, Applications of IoT, Connected cars IoT Transportation, Smart Grid and Healthcare sectors using IoT,

References/Text Books:

1) A Bahaga, V. Madisetti, “Internet of Things- Hands on approach”, University press, 2014.
2) S.K.Vasudevan, A.S.Nagarajan, “Internet of Things”, Wiley, 2019.
3) CunoPfister, “Getting started with Internet of Things”, Maker Media, 1st edition, 2011. Samuel Greenguard, “Internet of things”, MIT Press, 2015.

Web resources:

1) http://www.datamation.com/open-source/35-open-source-tools-for-the-internet-of-things-1.html
2) https://developer.mbed.org/handbook/AnalogIn
3) http://www.libelium.com/50_sensor_applications
4) M2MLabs Mainspring http://www.m2mlabs.com/framework Node-RED http://nodered.org/

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SCHEME OF STUDIES/EXAMINATIONS (*Semester-I*)
(Common with earlier scheme of Semester-I B.Tech Biotechnology which was effective from session 2018-19)

S.No	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1A	BS-111	Applied Physics	3:1:0	4	4	75	25	0	100	3
1B	BS-101	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105	Programming for Problem Solving	3:0:0	3	3	75	25	0	100	3
2B	HM-101	English	2:0:0	2	2	75	25	0	100	3
3	BS-131	Applied Mathematics-I	3:1:0	4	4	75	25	0	100	3
4A	ES-109	Engineering Graphics & Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111L	Manufacturing Processes Workshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101	Basic Electrical Engineering	4:1:0	5	5	75	25	0	100	3
6A	BS-113L	Applied Physics Lab	0:0:3	3	1.5	--	20	30	50	3
6B	BS-103L	Chemistry Lab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107L	Programming for Problem Solving Lab	0:0:2	2	1	--	20	30	50	3
7B	ES-103L	Basic Electrical Engineering Lab	0:0:2	2	1	--	20	30	50	3
8A	ES-113L	Engineering Graphics & Design Practice	0:0:3	3	1.5	--	20	30	50	3
8B	HM-103L	Language Lab	0:0:2	2	1	--	20	30	50	3
		Total	12:5:8/ 12:3:10	25/25	21.0/ 20.0	375/ 300	185/ 200	90/ 150	650A/ 650B	

Note: A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. Marked B in one particular semester. Induction Program (Three weeks duration) is a part of scheme of first year in I st semester for all branches

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SCHEME OF STUDIES/EXAMINATIONS (*Semester-II*)
(Common with earlier scheme of Semester-II B.Tech Biotechnology which was effective from session 2018-19)

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1A	BS-111	Applied Physics	3:1:0	4	4	75	25	0	100	3
1B	BS-101	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105	Programming for Problem Solving	3:0:0	3	3	75	25	0	100	3
2B	HM-101	English	2:0:0	2	2	75	25	0	100	3
3	BS-132	Applied Mathematics-II	3:1:0	4	4	75	25	0	100	3
4A	ES-109	Engineering Graphics & Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111L	Manufacturing Processes Workshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101	Basic Electrical Engineering	4:1:0	5	5	75	25	0	100	3
6A	BS-113L	Applied Physics Lab	0:0:3	3	1.5	--	20	30	50	3
6B	BS-103L	Chemistry Lab	0:0:3	3	1.5	--	20	30	50	3
7A	ES-107L	Programming for Problem Solving Lab	0:0:2	2	1	--	20	30	50	3
7B	ES-103L	Basic Electrical Engineering Lab	0:0:2	2	1	--	20	30	50	3
8A	ES-113L	Engineering Graphics & Design Practice	0:0:3	3	1.5	--	20	30	50	3
8B	HM-103L	Language Lab	0:0:2	2	1	--	20	30	50	3
		Total	12:5:8/ 12:3:10	25/ 25	21.0/ 20.0	375/ 300	185/200	90/150	650A/ 650B	

Note: (1) A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. Marked B in one particular semester.
(2) All students have to undertake the industrial training for 4 to 6 weeks after 2nd semester which will be evaluated in 3rd semester.

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SCHEME OF STUDIES/EXAMINATIONS (*Semester -III*)

S.No	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	BTS-201	Biochemistry	3:0:0	3	3	75	25	0	100	3
2	BTS-203	Microbiology	2:0:0	2	2	75	25	0	100	3
3	BTS-205	Molecular Biology	3:0:0	3	3	75	25	0	100	3
4	BTS-207	Genetics and Cell Biology	3:0:0	3	3	75	25	0	100	3
5	BTS-211	Cell and Molecular Biology Lab	0:0:4	4	2		40	60	100	3
6	BTS-213	Biochemistry Lab	0:0:3	3	1.5	-	40	60	100	3
7	BTS-215	Microbiology Lab	0:0:3	3	1.5		40	60	100	3
8	PTS-201	Technical Seminar	0:0:2	2	1		100	0	100	3
9	HTM-901	Universal Human Values II : Understanding Harmony	3:0:0	3	3	75	25	0	100	3
10	PTS-203	Industrial Training-I	0:0:2	2	1		100	0	100	3
		Total	14:0:14	28	21.0	375	445	180	1000	

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SCHEME OF STUDIES/EXAMINATIONS (*Semester -IV*)

S.No	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	PTC-202	Industrial Biotechnology	2:0:0	2	2	75	25	0	100	3
2	PTC-204	Green Biotechnology and Pollution Abatement	2:0:0	2	2	75	25	0	100	3
3	PTC-206	Immunology and Advanced Diagnostic Techniques	2:1:0	3	3	75	25	0	100	3
4	PTC-208	Recombinant DNA Technology	2:1:0	3	3	75	25	0	100	3
5	BTS-202	Principles of Thermodynamics and Organic Chemistry	2:1:0	3	3	75	25	0	100	3
6	PTC-210	Industrial Biotechnology Lab	0:0:4	4	2		40	60	100	3
7	PTC-212	Immunology and Advanced Diagnostic Techniques Lab	0:0:2	2	1		40	60	100	3
8	PTC-214	Recombinant DNA Technology Lab	0:0:4	4	2	-	40	60	100	3
9	ATU-202*	Environmental Sciences	3:0:0	3		75	25		100	3
		Total	13:3:10	26	18	450	270	180	900	

***ATU-202** is a mandatory credit less course in which the student will be required to get passing marks in the major test.
Note: All the students have to undergo 4-6 weeks industrial training after IV semester and to be evaluated in V semester.

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SCHEME OF STUDIES/EXAMINATIONS (*Semester -V*)

S.No	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	PTC-301	Metabolic Engineering	2:0:0	2	2	75	25	0	100	3
2	PTC-303	Biophysical and Bioanalytical Techniques	2:0:0	2	2	75	25	0	100	3
3	PTC-305	Structural Biology	2:0:0	2	2	75	25	0	100	3
4	PTC-307	Bioprocess Engineering	2:0:0	2	2	75	25	0	100	3
5	PTC-309	Bioinformatics and Computational Biology	2:0:0	2	2	75	25	0	100	3
6	PTE-1*	Professional Elective-I	2:1:0	3	3	75	25	0	100	3
7	PTC-311	Bioinformatics and Computational Biology Lab	0:0:2	2	2		40	60	100	3
8	PTC-313	Biophysical and Bioanalytical Techniques Lab	0:0:3	3	1.5		40	60	100	3
9	PTC-315	Metabolic Engineering Lab	0:0:3	3	1.5	-	40	60	100	3
10	OTS-1**	Open Subject-I	2:0:0	2	2	75	25		100	3
11	ATU-301	Indian Constitution	2:0:0	2	2	75	25		100	3
12	PTS-301	Industrial Training	0:0:2	2	1		100		100	3
13	**ATU-903	Essence of Indian Traditional Knowledge	3:0:0	3		100	-	-	100	3
		Total	19:1:10	30	23	700	420	180	1300	

****ATU-903** is a mandatory credit less course in which the student will be required to get passing marks in the major test.

Professional Elective-I*
PTE-301 Good Manufacturing and Lab Practices
PTE-303Genome Editing
PTE-305Biochemical and Enzyme Technology
PTE-307 Bioreactor Analysis and Design

Open Subject- I**
OTS-301 Biomaterial Technology
OTS-303 Internet of Things
OTS-305 Image Processing/MOOC Course
OTS-307 3D Printing & Design /MOOC Course``

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***SCHEME OF STUDIES/EXAMINATIONS (*Semester -VI)**

S.No	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	PTC-302	Downstream Processing and Bioseparation Engineering	3:1:0	4	4	75	25	0	100	3
2	PTC-304	Synthetic and Systems Biology	2:1:0	3	3	75	25	0	100	3
3	PTC-306	Animal and Plant Biotechnology	2:1:0	3	3	75	25	0	100	3
4	PTC-308	Data Science in Genome Technology	3:0:0	3	3	75	25	0	100	3
5	PTE-II*	Professional Elective-II	2:1:0	3	3	75	25	0	100	3
6	OTS-II**	Open Subject-II	2:0:0	2	2	75	25	0	100	3
7	PTC-308	Data Science in Genome Technology Lab	0:0:2	2	1		40	60	100	3
8	PTC-310	Downstream Processing Lab	0:0:2	2	1		40	60	100	3
9	PTC-312	Animal and Plant Biotechnology Lab	0:0:4	4	2		40	60	100	3
10	PTS-302	Technical Seminar	0:0:2	2	1	-	100	0	100	3
11	HSMC-1	Elective-1***	3;0:0	3	3	75	25	0	100	3
		Total	17:4:10	31	26	525	395	180	1100	

Students shall have to select one elective from each group of Program Elective-II, Open Subjects-II and HSMC Elective-1.

Professional Elective-II*
PTE-302 Machine Learning
PTE-304 Waste Management and Upcycling
PTE-306 Stem Cell Technology
PTE-308 Nanobiotechnology

Open Subject- II**
OTS-302 Artificial Intelligence
OTS-304 Quantum Computing/MOOC Course
OTS-306 Cyber Security /MOOC Course
OTS-308 Design Thinking

HSMC Elective-1***
HSMC-301 Engineering Economics
HSMC-302 Management-1 (Organizational Behaviour)
HSMC-303 Operations Research
HSMC-304 Effective Technical Communication

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SCHEME OF STUDIES/EXAMINATIONS (*Semester -VII*)

S.No	Course No./Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	PTC-401	Food and Nutrition Biology	2:0:0	2	2	75	25	0	100	3
2	PTC-403	Artificial Intelligence in Affordable Healthcare	2:0:0	2	2	75	25	0	100	3
3	PTE-III	Program Elective-III*	2:1:0	3	3	75	25	0	100	3
4	PTE-IV	Program Elective-IV*	2:1:0	3	3	75	25	0	100	3
5	OTS-III	Open Subject-III**	2:0:0	2	2	75	25	0	100	3
6	OTS-IV	Open Subject-IV**	2:0:0	2	2	75	25	0	100	3
7	HSMC-II	Elective-II***	3:0:0	3	3	75	25	0	100	3
8	PTC-405	Food and Nutrition Biology Lab	0:0:2	2	1	-	40	60	100	3
9	PTS-401	Project-I	0:0:4	4	2		40	60	100	3
10	PTS-403	Industrial Training	2:0:0	2	2		100		100	3
		Total	17:2:6	25	22	525	355	120	1000	

Students shall have to select one elective from each group of Program Elective-III/IV, Open Subjects-III/IV and HSMC Elective-II.

Program Elective-III*

PTE-401 Gene Expression and Transgenics
PTE-403 Essentials of Virology
PTE-405 Tissue Engineering
PTE-407 Biostatistics

Program Elective-IV*

PTE-409 Quality Control Management in Biotechnology
PTE-411 Biosensors & Bioinstrumentation
PTE-413 Biomedical Engineering
PTE-415 Omics Technology

Open Subject-III**	Open Subject-IV**	HSMC Elective-II***
OTS-401 Robotics	OTS-409 Bioterrorism and National Security	HSMC-401 Introduction to Industrial Management
OTS-403 Virtual Reality	OTS-411 Biosimilar Technology	HSMC-402 Industrial Psychology
OTS-405 Plant Biology	OTS-413 Comparative and Functional Genomics	HSMC-403 Innovation, Startups & Entrepreneurship
OTS-407 MOOC Course	OTS-415 MOOC Course	HSMC-404 Intellectual Property Rights (IPR) & Regulatory

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SCHEME OF STUDIES/EXAMINATIONS (*Semester -VIII*)

S.No	Course No./Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	PTS-402	Project-II	0:0:12	18	9		40	60	100	3
		Total	0:0:12	18	9		40	60	100	

Students opting for B.Tech. (HONS.) Biotechnology with minor specialization in Computational Biology, Drug Engineering, Genome Engineering and Technology, Artificial Intelligence & Machine Learning, Blockchain, Data Science, Internet of Things, Cyber Security, 3D Printing, Energy Engineering and Robotics shall have to earn 18 to 20 extra credits from the subjects mentioned in the annexures besides completing 160 credits of regular B.Tech. Biotechnology degree. The subjects mentioned in the annexures may be covered from MOOCs/SWAYAM portal.

KURUKSHETRA UNIVERSITY, KURUKSHETRA

(Established by the State Legislature Act XII of 1956)
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Nomenclature for B.TECH. Degree in Emerging Areas of Biotechnology

1. B. Tech. (Hons.) Biotechnology with Specialization in Computer Science and Biology
2. B. Tech. (Hons.) Biotechnology with Specialization in Drug Engineering
3. B. Tech. (Hons.) Biotechnology with Specialization in Genome Engineering & Technology
4. B. Tech. Biotechnology with Minor Degree in Artificial Intelligence & Machine Learning
5. B. Tech. Biotechnology with Minor Degree in Blockchain
6. B. Tech. Biotechnology with Minor Degree in Data Science
7. B. Tech. Biotechnology with Minor Degree in Internet of Things
8. B. Tech. Biotechnology with Minor Degree in Cyber Security
9. B. Tech. Biotechnology with Minor Degree in 3D Printing
10. B. Tech. Biotechnology with Minor Degree in Electrical Vahicle
11. B. Tech. Biotechnology with Minor Degree in Energy Engineering
12. B. Tech. Biotechnology with Minor Degree in Mechatronics
13. B. Tech. Biotechnology with Minor Degree in Robotics.

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Table 1: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Artificial Intelligence and Machine Learning

Artificial Intelligence and Machine Learning (Minimum credits to be earned are EIGHTEEN-TWENTY)		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/AI-1	Artificial Intelligence : Search Methods For Problem solving
	SPMD/AI-2	**OR** An Introduction to Artificial Intelligence
2.	SPMD/AI-3	Artificial Intelligence: Knowledge Representation and Reasoning
3.	SPMD/AI-4	Programming, Data Structures and Algorithms in Python
	SPMD/AI-5	**OR** Python for Data Science
4.	SPMD/AI-6	Introduction to Machine Learning
5.	SPMD/AI-7	Deep Learning
	SPMD/AI-8	**OR** Deep Learning for Computer Vision
6.	SPMD/AI-9	Reinforcement Learning
7.	SPMD/AI-10	AI: Constraint Satisfaction
8.	SPMD/AI-11	Computer Vision
9.	SPMD/AI-12	Natural Language Processing
	SPMD/AI-13	**OR** Applied Natural Language Processing
10.	SPMD/AI-14	Practical Machine Learning with Tensorflow
11.	SPMD/AI-15	Introduction to Data Analytics
	SPMD/AI-16	**OR** Data Science for Engineers
12.	SPMD/AI-17	Learning Analytics Tools
13.	SPMD-1	Design Thinking - A Primer
14.	SPMD-2	Ethics in Engineering Practice

Table 2: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Internet of Things (IoT)

Internet of Things (IoT) **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/IoT-1	Introduction to Industry 4.0 and Industrial Internet of Things
	SPMD/IoT-2	**OR** Introduction to Internet of Things
2.	SPMD/IoT-3	Electronic Systems for Sensor Applications
3.	SPMD/IoT-4	Optical Fiber Sensors
	SPMD/IoT-5	**OR** Optical Sensors
4.	SPMD/IoT-6	Introduction to Machine Learning
5.	SPMD/IoT-7	Selection of Nanomaterials for Energy Harvesting and Storage Application
6.	SPMD/IoT-8	Python for Data Science
7.	SPMD/IoT-9	Deep Learning
	SPMD/IoT-10	**OR** Deep Learning for Computer Vision
8.	SPMD/IoT-11	Reinforcement Learning
9.	SPMD/IoT-12	Cloud computing
	SPMD/IoT-13	**OR** Google Cloud Computing Foundations
10.	SPMD/IoT-14	Modern Application Development
11.	SPMD/IoT-15	Introduction to Data Analytics
	SPMD/IoT-16	**OR** Data Science for Engineers
12.	SPMD/IoT-17	Computer Networks and Internet Protocol
13.	SPMD/IoT-18	Introduction to Database Systems
14.	SPMD-1	Design Thinking – A Primer
15.	SPMD-2	Ethics in Engineering Practice

Table 3: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Blockchain

Blockchain **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/BL-1	Introduction to Blockchain Technology and Applications
	SPMD/BL-2	**OR** Blockchain Architecture Design and Use Cases
2.	SPMD/BL-3	Introduction to Internet of Things
3.	SPMD/BL-4	Information Security – 5 – Secure Systems Engineering
4.	SPMD/BL-5	Introduction to Machine Learning
5.	SPMD/BL-6	Ethical Hacking
6.	SPMD/BL-7	GPU Architectures and Programming
7.	SPMD/BL-8	Computer Networks and Internet Protocol
8.	SPMD/BL-9	Cloud computing
	SPMD/BL-10	**OR** Google Cloud Computing Foundations
9.	SPMD/BL-11	Foundations of Cryptography
10.	SPMD/BL-12	Information Theory and Coding
11.	SPMD/BL-13	Introduction to Database Systems
12.	SPMD/BL-14	Internetwork Security
13.	SPMD-1	Design Thinking – A Primer
14.	SPMD-2	Ethics in Engineering Practice

Robotics **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/RB-1	Foundations of Cognitive Robotics
2.	SPMD/RB-2	Introduction to Robotics
	SPMD/RB-3	**OR** Robotics
3.	SPMD/RB-4	Mechanism and Robot Kinematics
4.	SPMD/RB-5	Computer Architecture and Organization
5.	SPMD/RB-6	Power Electronics
6.	SPMD/RB-7	Principle of Hydraulic Machines and System Design
7.	SPMD/RB-8	Programming, Data Structures and Algorithms Using Python
8.	SPMD/RB-9	Control Systems
9.	SPMD/RB-10	Fundamentals of Artificial Intelligence
10.	SPMD/RB-11	Introduction to Machine Learning

11.	SPMD/RB-12	Dynamical System and Control
12.	SPMD/RB-13	Introduction to Embedded System Design
13.	SPMD/RB-14	Introduction to Internet of Things
	SPMD/RB-15	**OR** Introduction to Industry 4.0 and Industrial Internet of Things
14.	SPMD-1	Design Thinking – A Primer
15.	SPMD-2	Ethics in Engineering Practice

Table 4: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Data Science

Data Science **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/DS-1	Python for Data Science
	SPMD/DS-2	**OR** Programming, Data Structures and Algorithms in Python
2.	SPMD/DS-3	Introduction to Data Analytics
	SPMD/DS-4	**OR** Data Science for Engineers
3.	SPMD/DS-5	Programming, Data Structures and Algorithms in Python
	SPMD/DS-6	**OR** Python for Data Science
4.	SPMD/DS-7	Introduction to Machine Learning
5.	SPMD/DS-8	Deep Learning
	SPMD/DS-9	**OR** Deep Learning for Computer Vision
6.	SPMD/DS-10	Reinforcement Learning
7.	SPMD/DS-11	Artificial Intelligence : Search Methods For Problem solving
	SPMD/DS-12	**OR** An Introduction to Artificial Intelligence
8.	SPMD/DS-13	Artificial Intelligence: Knowledge Representation and Reasoning
9.	SPMD/DS-14	Computer Vision
10.	SPMD/DS-15	Natural Language Processing
	SPMD/DS-16	**OR** Applied Natural Language Processing
11.	SPMD/DS-17	Practical Machine Learning with Tensorflow
12.	SPMD/DS-18	Learning Analytics Tools
13.	SPMD-1	Design Thinking – A Primer
14.	SPMD-2	Ethics in Engineering Practice

Table 5: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Cyber Security

Cyber Security **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/CS-1	Cryptography And Network Security
2.	SPMD/CS-2	Ethical Hacking
3.	SPMD/CS-3	Information Security – 5 – Secure Systems Engineering
4.	SPMD/CS-4	Privacy and Security in Online Social Media
5.	SPMD/CS-5	Information Theory and Coding
6.	SPMD/CS-6	Introduction to Information Security
7.	SPMD/CS-7	Introduction to Cryptology
8.	SPMD/CS-8	Computational Number Theory & Cryptography
9.	SPMD/CS-9	Hardware Security
10.	SPMD/CS-10	Internetwork Security
11.	SPMD/CS-11	Introduction to Machine Learning
12.	SPMD/CS-12	Introduction to Internet of Things
13.	SPMD-1	Design Thinking – A Primer
14.	SPMD-2	Ethics in Engineering Practice

Table 6: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in 3D Printing

3D Printing **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/3D-1	Rapid Manufacturing
2.	SPMD/3D-2	Electronics Equipment Integration and Prototype Building
3.	SPMD/3D-3	Product Design and Development
4.	SPMD/3D-4	The Future of Manufacturing Business: Role of Additive Manufacturing
5.	SPMD/3D-5	Functional and Conceptual Design
6.	SPMD/3D-6	Introduction to Polymer Science
7.	SPMD/3D-7	Innovation by Design
8.	SPMD/3D-8	Design, Technology and Innovation
9.	SPMD-1	Design Thinking – A Primer
10.	SPMD-2	Ethics in Engineering Practice

Table 7: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Electric Vehicles

Electric Vehicles **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/EV-1	Fundamentals of Electric Vehicles: Technology & Economics
2.	SPMD/EV-2	Fundamentals of Electrical Engineering
3.	SPMD/EV-3	Electrical Machines
4.	SPMD/EV-4	Physics of Materials
	SPMD/EV-5	**OR** Powder Metallurgy
5.	SPMD/EV-6	Introduction to CFD
6.	SPMD/EV-7	Structural Analysis of Nanomaterials
7.	SPMD/EV-8	Ecology and Environment
8.	SPMD/EV-9	Dynamic Behavior of Materials
9.	SPMD/EV-10	Welding of Advanced High Strength Steels for Automotive Applications
10.	SPMD/EV-11	Dynamical System and Control
11.	SPMD-1	Design Thinking - A Primer
12.	SPMD-2	Ethics in Engineering Practice

Table 8: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Energy Engineering

Energy Engineering **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/EE-1	Fundamentals of Conduction and Radiation
	SPMD/EE-2	**OR** Fundamentals of Convective Heat Transfer
2.	SPMD/EE-3	Energy Conservation and Waste Heat Recovery
3.	SPMD/EE-4	Ecology and Environment
4.	SPMD/EE-5	Energy Economics and Policy
5.	SPMD/EE-6	Bioenergy
	SPMD/EE-7	**OR**Waste to Energy Conversion
6.	SPMD/EE-8	Non-Conventional Energy Resources
	SPMD/EE-9	**OR** Technologies for Clean and Renewable Energy Production
7.	SPMD/EE-10	Selection of Nanomaterials for Energy Harvesting and Storage Application
8.	SPMD/EE-11	Solar Energy Engineering and Technology
9.	SPMD-1	Design Thinking - A Primer
10.	SPMD-2	Ethics in Engineering Practice

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Table 9: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Mechatronics

Mechatronics **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/ME-1	Power Electronics
2.	SPMD/ME-2	Semiconductor Optoelectronics
	SPMD/ME-3	**OR** Semiconductor Devices and Circuits
3.	SPMD/ME-4	Digital Circuits
4.	SPMD/ME-5	Analog Electronic Circuits
5.	SPMD/ME-6	Control Systems
	SPMD/ME-7	**OR** Control Engineering
6.	SPMD/ME-8	Introduction to Internet of Things
7.	SPMD/ME-9	Introduction to Fuzzy Set Theory, Arithmetic and Logic
	SPMD/ME-10	**OR** Switching Circuits and Logic Design
8.	SPMD/ME-11	Microcontrollers and Applications
9.	SPMD/ME-12	Introduction to Embedded System Design
10.	SPMD/ME-13	Introduction to Robotic
11.	SPMD/ME-14	Optical Fiber Sensors
12.	SPMD/ME-15	Automation in Manufacturing
13.	SPMD-1	Design Thinking - A Primer
14.	SPMD-2	Ethics in Engineering Practice

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Table 10: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Computer Science and Biology

Computer Science and Biology **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/CB-1	Computational Systems Biology
2.	SPMD/CB-2	Introduction to Database Systems
3.	SPMD/CB-3	Introduction to Artificial Intelligence
	SPMD/CB-4	**OR** Artificial Intelligence Search Methods for Problem Solving
4.	SPMD/CB-5	Image Signal Processing
5.	SPMD/CB-6	Introduction to Internet of Things
6.	SPMD/CB-7	Introduction to Computer Graphics
	SPMD/CB-8	**OR** Computer Graphics
7.	SPMD/CB-9	MATLAB Programming for Numerical Computation
8.	SPMD/CB-10	Programming, Data Structures and Algorithms in Python
9.	SPMD/CB-11	Introduction to Machine Learning
10.	SPMD/CB-12	Data Mining
11.	SPMD/CB-13	Introduction to Dynamical Models in Biology
12.	SPMD/CB-14	Biometrics
13.	SPMD/CB-15	BioInformatics: Algorithms and Applications
14.	SPMD/CB-16	Introduction to Proteogenomics
15.	SPMD/CB-17	Foundations of Cryptography
16.	SPMD/CB-18	Modern Application Development
17.	SPMD/CB-19	Ethical Hacking
18.	SPMD/CB-20	Computer Aided Drug Design
19.	SPMD/CB-21	Functional Genomics
20.	SPMD-1	Design Thinking - A Primer
21.	SPMD-2	Ethics in Engineering Practice

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Table 11: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Drug Engineering

Drug Engineering **(Minimum credits to be earned are EIGHTEEN-TWENTY)**		
Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/DE-1	Drug Delivery: Principles and Engineering
2.	SPMD/DE-2	Experimental Biotechnology
3.	SPMD/DE-3	Spectroscopic Techniques for Pharmaceutical and Biopharmaceutical Industries
4.	SPMD/DE-4	Environmental Quality Monitoring & Analysis
5.	SPMD/DE-5	Computer Aided Drug Design
6.	SPMD/DE-6	Current Regulatory Requirements for Conducting Clinical Trials in India for Investigational New Drugs/New Drug
7.	SPMD/DE-7	Introduction to Dynamical Models in Biology
8.	SPMD/DE-8	Medical Biomaterials
9.	SPMD/DE-9	Metals in Biology
10.	SPMD/DE-10	Gene Therapy
11.	SPMD/DE-11	Introduction to Cardiovascular Fluid Mechanics
12.	SPMD/DE-12	Optical Sensors
13.	SPMD/DE-13	Nano Structured Materials- Synthesis, Properties, Self-assembly and Applications
14.	SPMD/DE-14	Transport Phenomena in Biological Systems
15.	SPMD/DE-15	Aspects of Biochemical Engineering
16.	SPMD/DE-16	Process Control Design, Analysis and Assessment
17.	SPMD/DE-17	Industrial Biotechnology
18.	SPMD/DE-18	Interactomics
19.	SPMD/DE-19	Health Research Fundamentals
20.	SPMD/DE-20	Computational Systems Biology
21.	SPMD/DE-21	Human Molecular Genetics
22.	SPMD-1	Design Thinking - A Primer
23.	SPMD-2	Ethics in Engineering Practice

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Table 12: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Genome Engineering & Technology

Genome Engineering & Technology **(Minimum credits to be earned are EIGHTEEN-TWENTY)** ***Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.***		
Sr. No.	**Code**	**Subject Nomenclature**
1.	SPMD/GE-1	Introduction to Proteogenomics
2.	SPMD/GE-2	Interactomics: Basics & Applications
3.	SPMD/GE-3	Drug Delivery: Principles and Engineering
4.	SPMD/GE-4	Experimental Biotechnology
5.	SPMD/GE-5	Bioengineering: An Interface with Biology and Medicine
6.	SPMD/GE-6	Functional Genomics
7.	SPMD/GE-7	Protein and Gel Based Proteomics
8.	SPMD/GE-8	Cell Culture Technologies
9.	SPMD/GE-9	Tissue Engineering
10.	SPMD/GE-10	Biomedical Nanotechnology
11.	SPMD/GE-11	Introductory Mathematical Methods for Biologists
12.	SPMD/GE-12	Nanotechnology in Agriculture
13.	SPMD/GE-13	Introduction to Proteomics
14.	SPMD/GE-14	Applications of Interactomics using Genomics and Proteomics Technologies
15.	SPMD/GE-15	Transport Phenomena in Biological Systems
16.	SPMD/GE-16	Proteomics and Genomics
17.	SPMD/GE-17	Medical Biomaterials
18.	SPMD/GE-18	Theromodynamics for Biological Systems: Classical and Statistical Aspect
19.	SPMD/GE-19	Mass Spectrometry Based Proteomics
20.	SPMD/GE-20	Advanced Clinical Proteomics
21.	SPMD/GE-21	Application of Spectroscopic Methods in Molecular Structure Determination
22.	SPMD/GE-22	Gene Therapy
23.	SPMD-1	Design Thinking - A Primer
24.	SPMD-2	Ethics in Engineering Practice

BS-111	Applied Physics						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3h
Purpose	To introduce the basics of physics to the students for applications in Engineering field.						
Course Outcomes							
CO 1	Introduce the fundamentals of interference and diffraction and their applications.						
CO 2	To make the students aware of the importance of polarization and Laser in technology.						
CO 3	Applications of optical fiber and ultrasonics in various fields.						
CO 4	Introduce the nuclear radiations and its biological effects.						

Unit - I

Interference: Principle of Superposition, Conditions for interference, Division of wave-front: Fresnel's Biprism and Applications, Division of amplitude: Wedge-shaped film, Newton's rings, Michelson Interferometer and Applications.

Diffraction: Types of diffraction, Fraunhofer diffraction at a single slit, Plane transmission diffraction grating: theory, secondary maxima and minima, width of principal maxima, absent spectra, overlapping of spectral lines, determination of wavelength; Dispersive power and resolving power of diffraction grating.

Unit – II

Polarization: Polarization of transverse waves, Plane of polarization, Polarization by reflection, Double refraction, Nicol Prism, Quarter and half wave plate, Specific Rotation, Laurent 's half shade polarimeter, Biquartzpolarimeter.

Laser: Introduction, Stimulated Absorption, Spontaneous and Stimulated Emission; Einstein's Coefficients and its derivation, Population Inversion, Direct and Indirect pumping, Pumping schemes, Main components of Laser, He-Ne Laser, Semiconductor Laser, Characteristics of Laser, Applications of Laser.

Unit – III

Optical Fiber: Introduction, Principle of propagation of light waves in optical fibers: total internal reflection, acceptance angle, numerical aperture, V- number; Modes of propagation, Types of optical fibers: single mode fiber, multimode fibers; Fiber optics communication system, Advantages of optical fiber communication, Applications of optical fibers.

Ultrasonics: Ultrasonic waves, Properties of ultrasonic waves, Production of ultrasonic waves: Magnetostriction and Piezoelectric methods, Detection of ultrasonic waves, Measurement of velocity of ultrasonic waves, Applications of ultrasonic waves.

Unit – IV

Nuclear radiations and its Biological Effects: Classification of nuclear radiations, Interaction of charged particle (light and heavy) and gamma radiations with matter (basic concepts), Dosimetric units, Relative Biological Effectiveness (RBE), Typical doses from commons sources in the environment, Biological Effects, Maximum Permissible Dose, (MPD), Shielding, Radiation safety in the nuclear radiation laboratory.

Biomaterials: Introduction, Classification of biomaterials, Applications.

Suggested Books:

1. Applied Physics for Engineers, Wiley India Pvt. Ltd.
2. Concepts of Modern Physics (5th edition), Tata McGraw-Hill Publishing Company Limited.
3. A Textbook of Optics, S. Chand & Company Ltd.
4. Techniques for Nuclear and Particle Physics Experiments: A How-to Approach, Springer-Verlag.
5. Introduction to Nuclear and Particle Physics, PHI Learning Private Limited.
6. Biomaterials: The intersection of Biology and Materials Science, Pearson, New Delhi.

Note: The paper setter will set the paper as per the question paper templates provided.

BS- 113L	Applied Physics Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	3	1.5	30	20	50	3h
Purpose	Give the knowledge of basic practicals of Physics in Engineering.						
Course Outcomes							
CO1	To make the students familiar with the experiments related with optics.						
CO2	To give the knowledge of handling of the experiments related with resistance using different methods.						

Note: Student will be required to perform at least 10 experiments out of the following list.

1. To verify Newton's formula and hence to find the focal length of the given convex lens.
2. To find the frequency of A.C. mains by using Sonometer and horse shoe magnet.
3. To find the resistance of a galvanometer by post office box.
4. To find low resistance by Carrey-Foster bridge.
5. To find the value of high resistance by substitution method.
6. To compare the capacitances of two capacitors by De-Sauty's bridge and hence to find the dielectric constant of a medium.
7. To convert a galvanometer into an ammeter of desired range and verify the same.
8. To find the wavelength of monochromatic light by Newton's ring experiment.
9. To find the wavelength of sodium light by Michelson's interferometer.
10. To find the resolving power of telescope.
11. To find the wavelength of sodium light using Fresnel bi-prism.
12. To find the wavelength of various colours of white light with the help of plane transmission diffraction grating.
13. To find the specific rotation of sugar solution by using a Polarimeter.

Suggested Books:

1. C.L.Arora, B. Sc. Practical Physics, S. Chand.
2. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
3. S.L. Gupta & V. Kumar, Practical Physics, Pragati Prakashan.

BS-101	Chemistry						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3h

Purpose	To familiarize the students with basic and applied concept in chemistry
CO1	An insight into the atomic and molecular structure
CO2	Analytical techniques used in identification of molecules
CO3	To understand Periodic properties
CO4	To understand the spatial arrangement of molecules

UNIT - I

Atomic and molecular structure (10 lectures)

Molecular orbitals of diatomic molecules (N_2, O_2, CO) Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and energy level diagrams of $[Co(NH_3)_6]$, $[Ni(CO)_4]$, $[PtCl_2(NH_3)_2]$ and magnetic properties of metal complexes. Band structure of solids and the role of doping on band structures.

UNIT - II

Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy(basic concept). Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Basic concepts of Nuclear magnetic resonance and magnetic resonance imaging, Diffraction and scattering.

UNIT - III

Use of free energy in chemical equilibria (4 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries (H_2O, NH_3, PCl_5, SF_6, CCl_4, $Pt(NH_3)_2Cl_2$

UNIT - IV

Stereochemistry (6 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis.

Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule(paracetamol and Aspirin)

Suggested Books:

1) University chemistry, by B. M. Mahan, Pearson Education
2) Chemistry: Principles and Applications, byM. J. SienkoandR. A. Plane
3) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan
5) Physical Chemistry, by P. W. Atkins
6) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore,5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Note: The paper setter will set the paper as per the question paper templates provided.

BS-103L	Chemistry Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	3	1.5	30	20	50	3h

LIST OF EXPERIMENTS

1. To Determine the surface tension of a given liquid
2. To determine the relative viscosity of a given liquid using Ostwald's viscometer
3. To identify the number of components present in a given organic mixture by thin layer chromatography
4. To determine the alkalinity of a given water sample
5. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using conductometer
6. Synthesis of a drug (paracetamol/Aspirin)
7. Determination of chloride content of a given water sample
8. To determine the calcium & magnesium or temporary & permanent hardness of a given water sample by EDTA method
9. To determine the total iron content present in a given iron ore solution by redox titration
10. Determination of the partition coefficient of a substance between two immiscible liquids
11. To find out the content of sodium, potassium in a given salt solution by Flame Photometer
12. To find out the λmax and concentration of unknown solution by a spectrophotometer
13. To find out the flash point and fire point of the given oil sample by Pensky Martin apparatus
14. To determine the amount of dissolved oxygen present in a given water sample
15. To find out the pour point and cloud point of a lubricating oil
16. Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using pH meter
17. Using Redwood Viscometer find out the viscosity of an oil sample

Note: Atleast 9 experiments to be performed from the list.

ES-105	Programming for Problem Solving						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3h
Purpose	To familiarize the students with the basics of Computer System and C Programming						
Course Outcomes							
CO 1	Describe the overview of Computer System and Levels of Programming Languages.						
CO 2	Learn to translate the algorithms to programs (in C language).						
CO 3	Learn description and applications of conditional branching, iteration and recursion.						
CO 4	To use arrays, pointers and structures to formulate algorithms and programs.						

UNIT – I

Overview of Computers: Block diagram and its description, Number systems, Arithmetic of number systems, Computer Hardware: Printers, Keyboard and Mouse, Storage Devices.
Introduction to programming language: Different levels of PL: High Level language, Assembly language, Machine language; Introduction to Compiler, Interpreter, Debugger, Linker, Loader, Assembler.
Problem Analysis: Problem solving techniques, Algorithms and Flowchart representation.

UNIT – II

Overview of C: Elements of C, Data types; Storage classes in C; Operators: Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators, precedence & associativity of operators.
Input/output: Unformatted & formatted I/O function in C.
Control statements: if statement, switch statement; Repetition: for, while, and do-while loop; break, continue, goto statements.

UNIT – III

Arrays: Definition, types, initialization, processing an array, String handling.
Functions: Definition, prototype, parameters passing techniques, recursion, built-in functions, passing arrays to functions, returning arrays from functions.

UNIT – IV

Pointers: Declaration, operations on pointers, pointers and arrays, dynamic memory allocation, pointers and functions, pointers and strings.
Structure & Union: Definition, processing, passing structures to functions, use of union. Data files: Opening and closing a file, I/O operations on files.

Suggested Books:

1. Brian W. Kernighan Dennis Ritchie, “C Programming Language” Pearson Education India.
2. Subrata Saha,Subhodip Mukherjee:Basic Computation & Programming with ‘C’-Cambridge University Press. 3.Ajay Mittal, “Programming in C - A Practical Approach”, Pearson.
   E Balagurusamy :Programming in ANSI C,TMH Education.
4. Pradip Dey and ManasGhose, “Computer Fundamental and Programming in C”, Oxford Pub.
5. ForouzanBehrouz, “Computer Science: A Structured Programming Approach Using C”, Cengage Learning.
6. 7.Ashok Kamthane, “Programming in C, 3e”, Pearson Education India..
8. Yashwant Kanetker, “Let us C”, BPB Publications.
9. A K Sharma, “ Fundamentals of Computers & Programming” DhanpatRai Publications
10. Rajaraman V., “Computer Basic and C Programming”, Prentice Hall of India Learning.

Note: The paper setter will set the paper as per the question paper templates provided.

ES-107L	Programming for Problem Solving Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	2	1	30	20	50	3h
Purpose	To Introduce students with problem solving using C Programming language						
Course Outcomes							
CO 1	To formulate the algorithms for simple problems						
CO 2	Implementation of arrays and functions.						
CO 3	Implementation of pointers and user defined data types.						
CO 4	Write individual and group reports: present objectives, describe test procedures and results.						

LIST OF PROGRAMS

1. Write a program to find the sum of individual digits of a positive integer.
2. Write a program to generate the first n terms of the Fibonacci sequence.
3. Write a program to generate all the prime numbers between 1 and n, where n is the input value given by the user.
4. Write a program to find the roots of a quadratic equation.
5. Write a function to generate Pascal's triangle.
6. Write a program for addition of Two Matrices
7. Write a program for calculating transpose of a matrix.
8. Write a program for Matrix multiplication by checking compatibility
9. Write programs to find the factorial of a given integer by using both recursive and non-recursive functions.
10. Write a function that uses functions to perform the count the lines, words and characters in a given text.
11. Write a program to explores the use of structures, union and other user defined variables
12. Write a program to print the element of array using pointers
13. Write a program to implement call by reference
14. Write a program to print the elements of a structure using pointers
15. Write a program to read a string and write it in reverse order
16. Write a program to concatenate two strings
17. Write a program to check that the input string is a palindrome or not.
18. Write a program which copies one file to another.
19. Write a program to reverse the first n characters in a file.

Note: At least 10 programs are to be performed & executed from the above list.

HM-101	English						
L	T	P	Credit	Major Test	Minor Test	Total	Time
2	-	-	2	75	25	100	3h

Course Outcomes	
CO 1	Building up the vocabulary
CO 2	Students will acquire basic proficiency in English including writing skills

UNIT- 1

Vocabulary Building

1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to formderivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

UNIT- 2

Basic Writing Skills

2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

UNIT- 3

Identifying Common Errors in Writing

3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

UNIT-4

Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion
4.6 Comprehension
4.7 Précis Writing
4.8 Essay Writing

Suggested Books:

(i) Practical English Usage. Michael Swan. OUP. 1995.
(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(iii) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006
(iv) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(v) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Note: The paper setter will set the paper as per the question paper templates provided.

HM-103L	Language Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
-	-	2	1	30	20	50	3h

OBJECTIVES

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

BS-131	APPLIED MATHEMATICS-I						
L	T	P	Credit	Major Test	Minor Test	Total	Time
3	1	-	4	75	25	100	3 h
Purpose	The objective of this course is to familiarize the prospective Biotechnology Engineers with techniques in Limit, Continuity, Differential & Integral Calculus and Complex Numbers. It aims to equip the students with standard concepts and tools at a beginner to intermediate and then at advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are as under:						
Course Outcomes							
CO1	To introduce the idea of sets, relations, functions, trigonometric functions, inverse trigonometric functions, these concepts are prerequisite to learn the concepts of differentiation and integration.						
CO 2	To introduce the Complex numbers which is fundamental to solve any kind of quadratic equations, Limit is precondition to understand the concept of rate of change and derivative.						
CO 3	To develop the essential tool of Continuity and Differentiability needed in evaluating higher order derivatives of functions.						
CO 4	To introduce the tools of Indefinite and Definite integrals of functions in a comprehensive manner that are used in various techniques dealing engineering problems.						

UNIT-I (12 hrs)

Sets, Relations, Functions

Sets and its types: Operations on sets, complement of a set, Cartesian Product of sets, relations , functions, types of functions, **Trigonometric functions:** Introduction, Angles, Trigonometric functions, Trigonometric functions of sum and difference of two angles, Trigonometric equations, **Inverse Trigonometric functions:** Introduction, basic concepts and its properties.

UNIT-II (12 hrs)

Pre-Calculus

Complex Numbers: Introduction, Algebra of Complex Numbers, Modulus and the conjugate of a complex number, quadratic equations, **Limits and Derivatives:** Introduction, Limits, Limits of Trigonometric Functions, Derivatives (single variable).

UNIT-III (12 hrs)

Differential Calculus

Continuity and Differentiability: Introduction, Continuity, Differentiability, Exponential and Logarithmic functions, Logarithmic differentiation, Derivatives of functions in parametric forms, second order derivatives, **Application of Derivatives (single variable)**: Increasing and decreasing functions, Maxima and Minima.

UNIT-IV (12 hrs)

Integral Calculus

Integrals: Introduction, Integration as an Inverse process of Differentiation, Method of Integration, Integration by Partial Fractions, Integration by Parts, **Definite Integrals**: Fundamental theorem of Calculus, Evaluation of Definite Integrals by Substitution, properties of Definite Integrals.

Suggested Books:

1. G. B. Thomas, R. L. Finney: Calculus and Analytic Geometry, Pearson Education.
2. Mathematics Textbook for Class 11^{th}& 12^{th} by NCERT.
3. Howard Anton: Calculus, Wiley Publication.
4. E. Kreyszig: Advanced Engineering Mathematics, Wiley India.

Note: The paper setter will set the paper as per the question paper templates provided.

BS-132	APPLIED MATHEMATICS-II						
L	T	P	Credit	Major Test	Minor Test	Total	Time
4	1	-	4.5	75	25	100	3 h
Purpose	The objective of this course is to familiarize the prospective Biotechnology Engineers with techniques in essential tool of linear algebra, how to solve a differential equation, utility of higher order derivatives in engineering domain, and fitting of a curve to given data. It aims to equip the students with standard concepts and tools at a beginner to intermediate and then at advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are as under:						
Course Outcomes							
CO1	To introduce the essential tool of matrices and linear algebra in a comprehensive manner to solve the large system of linear equations.						
CO 2	To introduce the statistical process used for estimating the parameters of a given curve or function to fit to a given data set using various degrees and types of curve fitting techniques.						
CO 3	To introduce effective mathematical tools for the solutions of differential equations that model physical processes.						
CO 4	To extend some concept of differential calculus for more than one variables.						

UNIT-I (10 Hrs)

Linear Algebra:

Introduction to matrices, its types, algebraic operations, transpose, determinant, minors and adjoint of a matrix. Elementary transformations, Inverse of a square matrix: Cramer's rule, Rank of a matrix, elementary matrices, Gauss Jordon method to find inverse using elementary transformations.

System of Linear equations: General representation, Homogeneous and Non-homogeneous system of linear equations, Consistency of linear system of equations, Gauss Elimination method to solve the system of linear equations.

UNIT-II (12 Hrs)

Theory of Equations:

Introduction, formation of equations, Relation between roots and coefficients, Reciprocal Equations, Transformation of equations.

Curve Fitting:

Introduction, Fitting of a straight line, fitting of second degree curve, fitting of a polynomial of degree m, fitting of a geometric or power curve of the form $y = ax^b$, fitting of an exponential curve of the form $Y= ab^x$.

UNIT-III (10 hrs)

Ordinary differential equations:

Introduction, order and degree of the differential equation, Formation of differential equation, Solution of the differential equation, Solution of the differential equation with variables separable and differential equations reducible to variable separable form, exact differential equation, and equations reducible to exact differential equations, linear and Bernoulli's equations, Euler's equations.

UNIT-IV (08 hrs)

Multivariable Calculus:

Partial derivatives, Total differential, Chain rule for differentiation, Partial derivatives of higher orders, Homogeneous functions, Euler's theorem on homogeneous functions, differentiation of an implicit function, Jacobian, Maxima and minima of a function of two variables, Lagrange's method of undetermined multipliers.

Suggested Books:

1. G. B. Thomas, R. L. Finney: Calculus and Analytic Geometry, Pearson Education.
2. H. Anton, Irl C Bivens, Stephen Davis: Calculus 10th Edition, John Wiley & Sons.
3. E. Kreyszig: Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. E. Kreyszig and S. Ahuja, Applied Mathematics-II, Wiley India Publication, Reprint 2015.
5. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press.
6. Mathematics Textbook for Class 11th& 12th by NCERT.

Note: The paper setter will set the paper as per the question paper templates provided.

Course Code	ES-109							
Course Title	Engineering Graphics& Design							
Scheme and Credits	L	T	P	Credits	Major Test	Minor Test	Total	Time
	1	2	0	3	75	25	100	3h

Course Outcomes

Objective- To expose students to the basics of Engineering Drawing, graphics and Projections.	
CO-1	To learn about construction of various types of curves and scales.
CO-2	To learn about orthographic projections of points, lines and planes.
CO-3	To Learn about the sectional views and development of Right regular solids
CO-4	To Learn about the construction of Isometric Projections and conversion of Isometric views to Orthographic views and vice-versa.

UNIT - I

IntroductiontoEngineeringDrawing:

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

UNIT - II

Orthographic Projections:

PrinciplesofOrthographicProjections-Conventions-Projections ofPointsandlinesinclined tobothplanes;Projectionsofplanesinclined to one principalPlane.

ProjectionsofRegular Solids:

Solid with axis inclinedtobothePlanes;

UNIT - III

Sections andSectionalViewsofRightRegular Solids:

Sectional views of simple right regular soilds like prism, pyramid, Cylinder and Cone. Development ofsurfacesofRightRegularSolids-Prism,Pyramid,CylinderandCone;

UNIT - IV

Isometric Projections:

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of IsometricViews to Orthographic Views and Vice-versa, Conventions;

Suggested Books:

1. Engineering Graphics using AUTOCAD 2000: T. Jeyapoovan, Vikas Publishing House.
2. Engineering Drawing: Plane and Solid Geometry: N.D. Bhatt and V.M.Panchal, Charotar Publishing House.
3. Engineering Drawing: Amar Pathak, Dreamtech Press, New Delhi.
4. Thomas E.French, Charles J.Vierck, Robert J.Foster, “Engineering drawing and graphic technology”, McGraw Hill International Editions.
5. Engineering Graphics and Drafting: P.S. Gill, Millennium Edition, S.K. Katariaand Sons.
6. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.
7. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press.
8. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann,1999.
9. BSI, Technical production documentation (TPD) – specification for defining, specifying and graphically reporting products, BS8888, 2002.
10. CorrespondingsetofCADSoftwareTheoryandUserManuals.

Note: The paper setter will set the paper as per the question paper templates provided.

Course code	ES-113L							
Coursetitle	Engineering Graphics & Design Practice							
Scheme and Credits	L	T	P	Credits	Practical	Minor Test	Total	Time
	-	-	3	1.5	30	20	50	3h
Pre-requisites(if any)	-							

Aim: To make student practice on engineering graphics and designsoftwaresand provide exposuretothevisualaspectsofengineeringdesign.	
CO-1	To give an overview of the user interface and toolboxes in a CAD software.
CO-2	To understand to customize settings of CAD software and produce CAD drawing.
CO-3	To practice performing various functions in CAD softwares.
CO-4	To Learn about solid modelling and demonstration of a simple team design project.

Module 1: Overview of Computer Graphics:

Listing the computer technologies that impact on graphical communication, Demonstrating Knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus(Button Bars),The Command Line(where applicable),The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Module2: Customization & CAD Drawing:

Setup of the drawing page and the printer ,including scale settings, Setting up of units and drawing limits ;ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Module3: Annotations, layering & other functions:

Applying dimensions to objects ,applying annotations to drawings ;Setting up and use of Layers ,layers to create drawings ,Create ,edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen);Printing documents to paper using the print command ;orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation ,Computer-aided design(CAD) software modeling of parts and assemblies .Parametric and non-parametric solid, surface, and wire frame models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises .Dimensioning guidelines ,tolerancing techniques; dimensioning and scale multi views of dwelling;

Module4: Demonstration of a simple team design project:

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blue print form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows ,doors ,and fixtures such as WC, bath ,sink ,shower ,etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modeling (BIM).

Suggested Books(ES-113L):

1. Chris McMahon and Jimmie Browne, CAD/CAM – Principle Practice and Manufacturing Management, Addison Wesley England, Second Edition, 2000.
2. Chougule N.K.; CAD/CAM /CAE, Scitech Publications India Pvt. Ltd.
3. Vikram Sharma; Computer Aided Design and Manufacturing, S.K. Kataria and Sons.
4. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989
5. Ibrahim Zeid, CAD/CAM theory and Practice, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1992.
6. M.P. Groover, Automation, Productions systems and Computer-Integrated Manufacturing by Prentice – Hall.
7. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.
8. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press.
9. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann,1999.
10. BSI, Technical production documentation (TPD) – specification for defining, specifying and graphically reporting products, BS8888, 2002.
11. (Corresponding set of)CAD Software Theory and User Manuals
12. Ibrahim Zeid, Mastering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
13. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.
14. Groover M.P. and Zimmers E. W., CAD/CAM: Computer Aided Design and Manufacturing, Prentice Hall International, New Delhi, 1992.
15. Dr. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, New Delhi, Second Edition, 2000.
16. Thomas E.French, Charles J.Vierck, Robert J.Foster, “Engineering drawing and graphic technology”, McGraw Hill International Editions.

Course code	ES-111L							
Coursetitle	Manufacturing Processes Workshop							
Scheme and Credits	L	T	P	Credits	Practical	Minor Test	Total	Time
	0	0	3	1.5	60	40	100	3h
Pre-requisites (if any)								

Aim: To make student gain a hands on work experience in a typical manufacturing industry environment.	
CO-1	To familiarize with different manufacturing methods in industries and work on CNC machine.
CO-2	To learn working in Fitting shop and Electrical and Electronics shops,
CO-3	To practice working on Carpentry and Plastic moulding/glass cutting jobs.
CO-4	To gain hands on practice experience on Metal casting and Welding jobs.

ManufacturingProcessesWorkshop Contents

1. Manufacturing Methods-casting, forming, machining ,joining, advanced manufacturing methods
2. CNCmachining, Additivemanufacturing
3. Fittingoperations&powertools
4. Electrical&Electronics
5. Carpentry
6. Plastic moulding ,glass cutting
7. Metalcasting
8. Welding(arc welding&gas welding), brazing

Suggested Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology" , 7th edition, Pearson Education India Edition.
2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., " Elements of Workshop Technology" , Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
3. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, " Processes and Materials of Manufacture" , 4th edition, Prentice Hall India, 1998
5. Rao P.N., " Manufacturing Technology" , Vol. I and Vol. II, Tata McGraw-Hill House, 2017.

BS-141	Biology (Revised)						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time Hrs.
2	1	-	3	75	25	100	3
Purpose	To familiarize the students with the basics of Biology and Biotechnology						
Course Outcomes							
CO1	Introduction to Living world, Cell & Organisms.						
CO2	Introduction to Biomolecules and Biocatalyst						
CO3	Introduction of basic Concept of Genetics & immune system						
CO4	Introduction of basic Concept of Genetic Engineering, Biochemistry & Role of Biology in Different Fields						

Unit – I

Introduction to living world: Concept and definition of Biology; Importance of biology in major discoveries of life Characteristic features of living organisms; Cell ultra-structure and functions of cell organelles like nucleus and endoplasmic reticulum. Difference between prokaryotic and eukaryotic cell. Difference between animal and plant cell.

Classification of Organisms: Classify the organisms on the basis of Cellularity Unicellular and Multicellular organisms. Energy and Carbon Utilization- Autotrophs, Hetrotrophs and Lithotrops. Nitrogen Excretion:- Ammonotelic, Uricotelic and Ureotelic. Habitat- Acquatic & Terrestrial.

Unit-II

Introduction to Biomolecules: Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids & Enzymes.

Enzymes as Biocatalysts: General characteristics, nomenclature and classification of Enzymes. Effect of temperature, pH, enzyme and substrate concentrations on the activity of enzymes. Elementary concept of and coenzymes. Mechanism of enzyme action.

Unit-III

Genetics:-Mendel's laws of inheritance. Variation and speciation. Concepts of recessiveness and dominance. Genetic Disorders: Single gene &Multiple genes disorders in human.

Human Traits: Genetics of blood groups, Diabetes Type I & II.

Role of immune system in health and disease: Brief introduction to morphology and pathogenicity of bacteria, fungi, virus, protozoa beneficial and harmful for human beings.

Unit-IV

Concepts of Genetic Engineering: Definition; Tools used in recombinant DNA Technology: Enzymes, Vectors & Passenger DNA.

Catabolism: Glycolysis and Krebs cycle, Photosynthesis:- Light and Dark Reaction. Concept of Exothermic and endothermic reactions

Role of Biology: Role of Biology in Agriculture, Medicine, Forensic science, Bioinformatics, Nanotechnology, Bio-MEMS and Biosensors.

Text Book:

1. Introduction to Biotechnology, By Deswal & Deswal, Dhanpat Rai Publications N.A
2.Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.

D. L. Nelson and M. M. Cox, “Principles of Biochemistry”, W.H. Freeman and Company, 2012.
4.G. S. Stent and R. Calendar, “Molecular Genetics”, Freeman and company, 1978.

Suggested Books:

1. Molecular Biology of cell, 4th ed. Alberts, Bruce et al. Garland Science Publishing, New York.
2. Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. Tata McGraw Hill, New Delhi.
3. Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox. Maxmillan/ Worth publishers.
4. Molecular Biotechnology: Principles Application of Recombinant DNA. Glick, B. R. and Pasternak, J. J. ASM press Washington DC.
5. Kuby’s Immunology, Goldsby, R A,.Kindt, T.J, Osborne, B.A.(2003) W. H. Freeman and company, New York.
6. Recombinant DNA 2nd Edition. Watson, James D. and Gilman, M. (2001) W.H Freeman and Company, NewYork.

Note: The paper setter will set the paper as per the question paper templates provided

ES-101	BASIC ELECTRICAL ENGINEERING						
L	T	P	Credit	Major Test	Minor Test	Total	Time(Hrs)
4	1	-	5	75	25	100	3
Purpose	To familiarize the students with the basics of Electrical Engineering						
Course Outcomes							
CO1	Deals with steady state circuit analysis subject to DC.						
CO 2	Deals with AC fundamentals & steady state circuit response subject to AC.						
CO 3	Deals with introductory Balanced Three Phase System analysis and Single Phase Transformer.						
CO 4	Explains the Basics of Electrical Machines & Electrical installations						

Unit-I

D.C. circuits: Ohm's Law, junction, node, circuit elements classification: Linear & nonlinear, active & passive, lumped & distributed, unilateral & bilateral with examples. KVL, KCL, Loop and node-voltage analysis of resistive circuit. Star- Delta transformation for resistors.**Network Theorems:** Superposition, Thevenin's, Norton's and Maximum power transfer theorems in a resistive network.

Unit-II

AC Fundamentals: Mathematical representation of various wave functions. Sinusoidal periodicsignal, instantaneous and peak values, polar & rectangular form of representation of impedances and phasor quantities. Addition & subtraction of two or more phasor sinusoidal quantities using component resolution method.RMS and average values of various waveforms.

A.C. Circuits: Behavior of various components fed by A.C. source (steady state response of pureR, pure L, pure C, RL, RC, RLC series with waveforms of instantaneous voltage, current & power on simultaneous time axis scale and corresponding phasor diagrams), power factor, active, reactive & apparent power. Frequency response of Series & Parallel RLC ckts. including resonance, Q factor, cut-off frequency & bandwidth. Generation of alternating emf.

Unit-III

Balanced Three Phase Systems: Generation of alternating 3- phase emf). 3-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of 3-phase power by two wattmeter method for various types of star & delta connected balanced loads.

Single Phase Transformer (qualitative analysis only): Concept of magnetic circuits.Relation between MMF & Reluctance.Hysteresis & Eddy current phenomenon. Principle, construction &emf equationPhasor diagram at ideal, no load and on load conditions. Losses & Efficiency, regulation. OC & SC test, equivalent circuit, concept of auto transformer.

Unit-IV

Electrical Machines (qualitative analysis only)**:** Construction and working of dc machine with commutator action, speed control of dc shunt motor. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Basics of Single-phase induction motor, capacitor start capacitor run Single-phase induction motor working. Basic construction and working of synchronous generator and motor.

Electrical Installations (LT Switchgear): Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.

Suggested Books:

1. Basic Electrical Engg: A complete Solution by Vijay Kumar Garg, Wiley India Ltd.
2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
3. Basic Electrical Engg. by S.K. Sahdev, Pearson Education
4. Electrical Engg. Fundamentals: by Bobrow, Oxford Univ. Press
5. Basic Electrical Engg. By Del Toro.
6. Saxena & Dasgupta: Fundamentals of Electrical Engg (Cambridge University Press).

Note: The paper setter will set the paper as per the question paper templates provided.

ES-103L	BASIC ELECTRICAL ENGINEERING LAB						
L	T	Practical	Credit	Minor Test	(Practical)	Total	Time (Hrs)
-	-	2	1	20	30	50	3
Purpose	To familiarize the students with the Electrical Technology Practicals						
Course Outcomes							
CO1	Understand basic concepts of Network theorems						
CO 2	Deals with steady state frequency response of RLC circuit parameters solution techniques						
CO 3	Deals with introductory Single Phase Transformer practicals						
CO 4	Explains the constructional features and practicals of various types of Electrical Machines						

LIST OF EXPERIMENTS

1. To verify KVL and KCL.
2. To verify Superposition theorem on a linear circuit with at least one voltage & one current source.
3. To verify Thevenin's Theorem on a linear circuit with at least one voltage & one current source.
4. To verify Norton's Theorem on a linear circuit with at least one voltage & one current source.
5. To study frequency response of a series R-L-C circuit on CRO and determine resonant frequency&
   Q- factor for various Values of R, L, and C.
6. To study frequency response of a parallel R-L-C circuit on CRO and determine resonant frequency&
   Q - Factor for various values of R, L, and C.
7. To perform O.C. and S.C. tests on a single phase transformer.
8. To perform direct load test on a single phase transformer and plot efficiency v/s load characteristic.
9. To perform speed control of DC shunt motor.
10. To perform starting & reversal of direction of a three phase induction motor.
11. Measurement of power in a 3 phase balanced system by two watt meter method.
12. Study of Cut sections of DC Machines, Induction Motor
13. To study components of various LT Switchgears

Note: At least 9 out of the listed experiments to be performed during the semester.

Bachelor of Technology (Electronics & Communication Engineering) (Credit Based)

KURUKSHETRA UNIVERSITY KURUKSHETRA

Scheme of Studies/Examination Semester IV (w.e.f. session 2021-2022)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	BS-204	Higher Engineering Mathematics	3:0:0	3	3	75	25	0	100	3
2	HTM-901	Universal Human Values II : Understanding Harmony	3:0:0	3	3	75	25	0	100	3
3	EC- 202	Digital Communication	3:0:0	3	3	75	25	0	100	3
4	EC-204L	Communication Lab	0:0:2	2	1	-	40	60	100	3
5	EC-206	Analog Circuits	3:0:0	3	3	75	25	0	100	3
6	EC-208L	Analog Circuits Lab	0:0:2	2	1	-	40	60	100	3
7	EC-210	Microprocessors & Microcontrollers	3:0:0	3	3	75	25	0	100	3
8	EC-212L	Microprocessors & Microcontrollers Lab	0:0:2	2	1	0	40	60	100	3
9	ES-202	Basics of Analog Communication	3:0:0	3	3	75	25	0	100	3
10	*MC-902	Constitution of India	3:0:0	3	-	75	25	0	100	3
		Total		**27**	**21**	**450**	**270**	**180**	**900**	

***MC-902 is a mandatory credit-less course in which the students will be required to get passing grade.**

Note: All the students have to undergo 4 to 6 weeks Industrial Training after 4th semester which will be evaluated in 5th semester

HTM-901	Universal Human Values II: Understanding Harmony						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3.0**	**75**	**25**	**100**	**3 Hours**
Purpose	Purpose and motivation for the course, recapitulation from Universal Human Values-I						
Course Outcomes (CO)							
CO 1	Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.						
CO 2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.						
CO 3	Strengthening of self-reflection.						
CO 4	Development of commitment and courage to act.						

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment ofaspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at variouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrarinessin choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-HumanRelationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the othersalient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- fromfamily to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" canbe used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. todiscuss the conduct as an engineer or scientist etc.

READINGS:

Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J CKumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

MODE OF CONDUCT

Lecture hours are to be used for lecture/practice sessions.

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at handand motivating students to reflect, explore and verify them.

Practice hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions, the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Practice experiments are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic

human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.
This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

ASSESSMENT:
This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.
Example:
Assessment by
faculty mentor: 5 marks
Self-assessment: 5 marks
Assessment by peers: 5 marks
Socially relevant project/Group Activities/Assignments: 10 marks
Semester End Examination: 75 marks
The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING UNIVERSITY INSTITUTE OF ENGINEERING & TECHNOLOGY (U.I.E.T)
(A Constituent Autonomous Institute and Recognized by UGC under Section 12 (B) and 2 (f)); AICTE Approved; TEQIP -III)
Kurukshetra University, Kurukshetra (K.U.K) – 136119, Haryana, INDIA
(Established by the state Legislature Act XII of 1956; 'A+' Grade, NAAC Accredited) Phone: +91-1744-239155; Fa x: +91-1744-238967, Web: http://www.uietkuk.org

A. Definition of Credit:

1 Hour Lecture (L) per week	1 credit
1Hour Tutorial (T) per week	1 credit
1 Hour Practical (P) per week	0.5 credit
2 Hours Practical (Lab) per week	1 credit

B. Range of Credits:

A total credit of 160 is required for a student to be eligible to get Under Graduate degree in **Electronics and Communication Engineering**. A student will be eligible to get Under Graduate degree **(B.Tech.) with Honours**, if he/she completes an additional 20 credits. These could be acquired through MOOCs at Swayam portal or with in-house examination being conducted. In order to have an Honours degree, a student may choose minimum 20 credits provided that the student must ensure the course is approved by the Competent Authority, Government of India

Bachelor of Technology (Electronics & Communication Engineering) (Credit Based) KURUKSHETRA UNIVERSITY KURUKSHETRA
Scheme of Studies/Examination
Semester VII (w.e.f. session 2021-2022)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs)
						Major Test	Minor Test	Practical	Total	
1	HM- 904	Intellectual Property Rights for Technology Development & Management	3:0:0	3	3	75	25	0	100	3
2	ECP*	Program Elective-III	3:0:0	3	3	75	25	0	100	3
3	ECP*	Program Elective-IV	3:0:0	3	3	75	25	0	100	3
4	ECP*	Program Elective Labs-V	0:0:4	4	2	-	40	60	100	3
5	ECO*	Open Elective-III	3:0:0	3	3	75	25	0	100	3
6	EC-401L	Project Stage-I	0:0:8	8	4	-	40	60	100	3
7	**EC-403	Industrial Training-III	2:0:0	2	-	-	*100	-	*100	3
		Total		**26**	**18**	**300**	**180**	**120**	**600**	

*** The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

**EC-403 is a mandatory credit-less course in which the students will be evaluated for the industrial training undergone after 6th semester and students will be required to get passing marks to qualify.

Bachelor of Technology (Electronics & Communication Engineering) (Credit Based) KURUKSHETRA UNIVERSITY KURUKSHETRA
Scheme of Studies/Examination
Semester VIII (w.e.f. session 2021-2022)

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration Of Exam. (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	ECP*	Program Elective-VI	3:0:0	3	3	75	25	0	100	3
2	ECP*	Program Elective-VII	3:0:0	3	3	75	25	0	100	3
3	ECO*	Open Elective-IV	3:0:0	3	3	75	25	0	100	3
4	ECO*	Open Elective-V	3:0:0	3	3	75	25	0	100	3
5	EC-402L	Project Stage-II	0:0:10	10	5	-	40	60	100	3
6	ECP*	Program Elective Labs-VIII	0:0:4	4	2		40	60	100	3
		Total		26	19	300	180	120	600	

***The course of both Program Elective and Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.**

Bachelor of Technology (Electronics & Communication Engineering) (Credit Based) KURUKSHETRA UNIVERSITY KURUKSHETRA
Scheme of Studies/Examination

LIST OF OPEN ELECTIVES (B.TECH. ECE)		
SEM	**CODE**	**SUBJECT**
VII	**Open Elective-III**	
	ECO-9	Bio-informatics
	ECO-10	Electromechanical Energy Conversion
	ECO-11	Operating Systems
VIII	**Open Elective-IV**	
	ECO-12	Wavelets
	ECO-13	Soft Computing
	ECO-14	Neural Networks and Fuzzy Logic
	Open Elective-V	
	ECO-15	Statistics and Operational Research
	ECO-16	Mixed Signal Design
	ECO-17	Blockchain Technology

LIST OF PROGRAM ELECTIVES (B.TECH. ECE)		
SEM	**CODE**	**SUBJECT**
VII	**Program Elective-III**	
	ECP-10	Fiber Optic Communications
	ECP-11	Mobile Communication and Networks
	ECP-12	Adaptive Signal Processing
	ECP-13	Nano electronics
	Program Elective-IV	
	ECP-14	Microwave Theory and Techniques
	ECP-15	Embedded systems
	ECP-16	Robotics
	ECP-17	Digital Image Processing
	Program Elective Labs-V	
	ECP-14L	Microwave Communication Lab
	ECP-15L	Embedded System Lab
	ECP-16L	Robotics Lab
	ECP-17L	Digital Image Processing Lab
VIII	**Program Elective –VI**	
	ECP-18	Wireless Communication
	ECP-19	Biomedical Signal Processing
	ECP-20	Machine Learning
	ECP-21	Artificial Intelligence
	ECP-22	Internet of Things
	Program Elective –VII	
	ECP-23	Error correcting codes
	ECP-24	Satellite Communication
	ECP-25	High Speed Electronics
	ECP-26	Software Defined Radio
VIII	**Program Elective Labs-VIII**	
	ECP-18L	Wireless Communication Lab
	ECP-19L	Biomedical Lab
	ECP-20L	Machine Learning Lab
	ECP-21L	Artificial Intelligence Lab
	ECP-22L	Internet of Things Lab
	ECP-23L	Augmented Reality/Virtual Reality Lab

HM-904	Intellectual Property Rights for Technology Development & Management						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.						
CO2	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.						
CO3	To understand different laws related to the Intellectual Property ,copyright act,trademarks,patent act,duration of patents law and policy considerations						
CO4	Underastand New Developments in IPR ,administration of patent system,IPR of biological systems etc.						

Unit-I

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit-II

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit-III

Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

Unit-IV

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books/Reference Books:-

- T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
- Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co
- Bare text (2005), Right to Information Act
- O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
- Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House

Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill

ECO-9	BIOINFORMATICS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**The Purpose of this course to provide focus on the key concepts of Bioinformatics like biological databases, Sequence Alignment, Phylogenetic Analysis, Plasmid Mapping And Primer Design and Predictive Methods using nucleotide sequences and protein sequences**						
Course Outcomes							
CO1	Students will be able to illustrate with the basic principles of various types of databases						
CO2	Students will be able to perform various tools related to sequence alignment and statistical significance of alignment						
CO3	Student will develop the knowledge of various software tools for sequence analysis and primer designing						
CO4	Students will be able to differentiate between predictive methods for nucleotides and protein sequence analysis						

UNIT I

Databases

a. Sequence Databases: introduction of Databases, primary and secondary databases, nucleotide and protein sequence databases: Genbank, EMBL, DDBJ, Swissprot, pfam, PIR

b. Structure Databases: Introduction to structures. PDB (Protein Data bank) Molecular Modeling database at NCBI. , visualizing structural information.

c. Sequence and Structure File Formats.

The Entrez system: Integrated information axis, Information retrieval from biological database, sequence database beyond NCBI. Medical databases.

UNIT II

Sequence Alignment AND Database Searches

Introduction, the evolutionary basis of sequence alignment, Type of Aligmnents, Pair-wise Alignment, Multiple Alignment, The modular nature of proteins, Optimal alignment methods, substitution scores and gap penalties, statistical significance of alignment. FASTA, BLAST, low-complexity regions, repetitive elements, Tool of multiple sequence alignment: CLUSTAL W/X, progressive alignment method.

Phylogenetic Analysis:

Elements of phylogenetic models, phylogenetic data analysis: alignment, substitution model building, tree building and tree evaluation, building the data model (alignment), determining the substitution model, tree- building methods, searching for trees, rooting trees, evaluation trees and data, phylogenic software (PHYLIP). phylogenetics online tool.

UNIT III

Sequence Analysis Using Software Resources :

Introduction. The Wisconsin package, the Seq Lab environment, analyzing sequences with operations and Wisconsin package programmes, viewing output, monitoring programme progress and troubleshooting problems, annotating sequences and graphically displaying annotations in the Seqlab Editor, saving sequences in the Seq Lab Editor, Example of analysis that can be undertaken in Seqlab,

UNIT IV

Plasmid Mapping And Primer Design

Restriction mapping, Mac Vector and OMIGA. primer design for PCR Sequencing, primer design programs and software.

Predictive Methods using nucleotide sequences and protein sequences: Predictive methods using nucleotide sequences: Introduction, Gene prediction methods, Computational gene prediction in eukaryotes , identity based on composition, physical properties based on sequence, prediction of protein secondary and tertiary structures. Related software.

Text Books-

1. Bioinformatics by Andreas D.Boxevanis. Wiley Interscience, 4th edition 2020.

2. Essential bioinformatics by Jin Xiong. Cambridge Uni Press 2020

3. Biocomputing Informatics and The Genome Projects by Smith D.W., Academic Press, 2014.

4. Bioinformatics: A Biologists Guide to Computing and the Internet. by Stuart M. Brown, NKU Medical Center, NY USA, 2000.

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

ECO-10	Electro-Mechanical Energy Conversion						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3**
Purpose	**To provide the constructional and working knowledge of various EMEC Devices.**						
Course Outcomes							
CO 1	**To study various fundamental concepts of EMEC& DC machines.**						
CO 2	**To study fundamental concepts and characteristics of Induction Machines.**						
CO 3	**To study the basics of S**ynchronous Machines						
CO 4	**To study working idea of some special electric motors with applications.**						

UNIT-I(Qualitative analysis only)

Introduction: Basic principles, conservation of energy, physical phenomenon involved in conversion, energy balance, energy stored in magnetic field, principles of Generating and motoring, prime movers, necessity of starters in motoring.

DC MACHINES:

DC generator: Basic construction, theory and working, commutation,generated EMF equation,Demagnetizing and cross magnetizing ampere turns, armature reaction,voltage build-up,brief idea of load characteristics of shunt, series and compound generator.

DC motor: Basic construction, theoryand working, concept of back EMF, torque and power equations, brief idea of load characteristics of shunt, series and compound motor, armature and field control methods of speed control of a DC shunt motor,3 point starter.

UNIT-II(Qualitative analysis only)

INDUCTION MACHINES:

3-phase induction motors:Rotating magnetic field, Basic construction, theory and working ofsquirrel cage and phase wound rotor types of3-phase I.M., slip, Torque- slip and load characteristics. Blocked rotor tests power and BHP developed at shaft. Star delta starting.

Single phase Induction Motor: Basic construction of, double revolving field theory, working of a capacitor start capacitor run Single phase Induction motor.

UNIT-III (Qualitative analysis only)

SYNCHRONOUS MACHINES:

Synchronous generator (alternator): Basic construction, theory and working, types of rotors&excitation systems.

Synchronous motor:Basic construction, theory and working of, locking operation, speed torque characteristics, V- Curves. Hunting -causes and remedies.

UNIT-IV(Qualitative analysis only)

SPECIAL ELECTRICAL MACHINES:

Basic concept and workingideas of:Stepper motor, permanent magnet brushless DC motor, permanent magnet synchronous motor, hysteresis motor, synchronous reluctance motor, repulsion motor.

Industrial and domestic applications and comparison of various types of motors.

Text/Reference Books

1. D.P Kothari and I.J Nagrath, “Electric Machines”, Tata McGraw Hill Publishers
2. P.S Bhimbra, “Electric Machines”, Khanna Publisher
3. AshfaqHussain, “Electric Machines”, DhanpatRai and Company
4. Fitzgerald &Kingsley, Electrical Machines, MGH publications.

ECO-11	Operating Systems						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3 Hr.
Course Outcomes							
CO1		Student will be able to understand structure and function of OS.					
CO2		Student will be able to understand the concept of OS					
CO3		Student will be able to understand the concurrent processing					
CO4		Student will be able to understand scheduling and deadlock in OS.					

Unit- I

Introduction:OS functions: as user/computer interface, interaction with OS, commands, efficient resource manager, security and protection, evolution of OS, OS structure and future trends.

Unit- II

OS Prerequisites: Important software resources, interaction with OS in mainframe systems: PSW,controlling i/o, interrupt, interrupt priority, interrupt cycle. Fundamental concept related to IPC.

Unit -III

Concurrent Processing : Introduction, process concept, process control block, exec sys, concurrent program, process state transitions, hierarchy of processes.

Unit-IV

Scheduling: CPU scheduling algorithms: allocation of different resources, scheduling queues, different scheduling algorithms.
Deadlock: Introduction, deadlock and starvation, resource allocation graph, way to solve dedlock.

Text Books:
1. P. P Choudhary, Operating Systems by PHI Learning Pvt Ltd.

Reference Books:
1. Operating Systems : Internals and Design Principles, William Stallings, Pearson
2.Operating System Concepts", Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, Wiley

Note: Question paper template will be provided to the paper setter.

ECO-12	Wavelets						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	-	-	**3**	**75**	**25**	**100**	**3**
Purpose	**To understand the concept of wavelet theory and applications.**						
Course Outcomes **At the end of this course, student will be able to**							
CO 1	Interpret stationary and non-stationary signals						
CO 2	Construct continuous wavelet transform						
CO 3	Develop discrete wavelet transform						
CO 4	Apply wavelets in different applications						

Unit-I

Introduction Stationary and non-stationary signals, Signal representation using basis and frames, Brief introduction to Fourier transform and Short time Fourier transform, Time- frequency analysis, Bases of time frequency: orthogonal, Filter banks, Multi resolution formulation: Wavelets from filters, Classes of wavelets: Haar, Daubechies, bi-orthogonal.

Unit-II

Continuous Wavelet Transform Continuous wavelet transform (CWT), Time and frequency resolution of the continuous wavelet transform, Construction of continuous wavelets: Spline, orthonormal, bi-orthonormal, Inverse continuous wavelet transform, Redundancy of CWT, Zoom property of the continuous wavelet transform, Filtering in continuous wavelet transform domain.

Unit-III

Discrete Wavelet Transform And Filter banks Orthogonal and bi- orthogonal two-channel filter banks, Design of two-channel filter banks, Tree-structured filter banks, Discrete wavelet transform, Non-linear approximation in the Wavelet domain, multi resolution analysis, Construction and Computation of the discrete wavelet transform, the redundant discrete wavelet transform.

Unit-IV

Multi Resolution Analysis Multirate discrete time systems, Parameterization of discrete wavelets, Bi-orthogonal wavelet bases, Two dimensional, wavelet transforms and Extensions to higher dimensions, wave packets, Application of wavelets in signal de-noising.

TEXT BOOKS:

1. A Wavelet Tour of Signal Processing, 2nd edition, S. Mallat, Academic Press, 1999.
2. Wavelets and Sub band Coding, M. Vetterli and J. Kovacevic, Prentice Hall, 1995.
3. Wavelet transforms: Introduction, Theory and applications, Raghuveer rao and Ajit S.Bopardikar, Pearson Education Asia, 2000.

REFERENCES:

1. Fundamentals of Wavelets: Theory, Algorithms, and Applications, J.C. Goswami and A.K. Chan, 2nd ed., Wiley, 2011.
2. Wavelets and their Applications, Michel Misiti, Yves Misiti, Georges Oppenheim, Jean- Michel Poggi, John Wiley & Sons, 2010 .
3. A premier on Wavelets and their scientific applications, J S Walker, CRC press, 2002.
4. Wavelets and signal processing: An application based introduction, Stark, Springer, 2005.
5. A friendly guide to Wavelets, Gerald keiser, Springer, 2011.
6. Multirate Systems and Filter Banks, P. P. Vaidyanathan, Pearson Education, 2004. Wavelets : from math too practice, Desanka.P.Radunovik, springer, 2009.
7. Insight into wavelets from theory to practice, K P Soman and KL Ramachandran, PHI, 2008.

ECO-13	Soft Computing						
Lecture (Hrs.)	Tutorial (Hrs.)	Practical (Hrs.)	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3Hr
Purpose	To familiarize the students with the basics of Soft Computing						
Course Outcomes							
CO1	Motivation and historical background of Soft Computing.						
CO 2	Application of Fuzzy logic.						
CO 3	Biologically inspired algorithm such as neural networks, genetic algorithms, ant colony optimization, and bee colony optimization.						
CO 4	Hybrid systems of neural network, genetic algorithms and fuzzy systems.						

Unit-I

Soft Computing and Artificial Intelligence: Introduction of Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, AI Search Algorithm, Predicate Calculus, Rules of Interference, Semantic Networks, Frames, Objects, Hybrid Models

Unit-II

Artificial Neural Networks and Paradigms: Introduction to Neuron Model, Neural Network Architecture, Learning Rules, Perceptrons, Single Layer Perceptrons, Multilayer Perceptrons, Back propagation Networks, Kohnen'sself-organizing networks, Hopfield network, Applications of NN.

Unit-III

Fuzzy Logic: Introduction, Fuzzy sets and Fuzzy reasoning, Basic functions on fuzzy sets, relations, rule-based models and linguistic variables, fuzzy controls, Fuzzy decision making, applications of fuzzy logic.

Unit-IV

Genetic Algorithms and Swarm Optimizations: Introduction, Genetic Algorithm, Fitness Computations, Cross Over, Mutation, Evolutionary Programming, Classifier Systems, Genetic Programming Parse Trees, Variants of GA, Applications, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization.

Text Books:

1. Simon S. Haykin, Neural Networks, Prentice Hall, 2nd edition.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill.
3. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y.

Reference Books:

1. Zimmermann, “Fuzzy Set Theory and its Application”, 3rd Edition.
2. B. Yegnanrayana , “Artificial Neural Networks” , PHI.
3. Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House.
4. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall.

ECO-14	Neural Networks and Fuzzy Logic						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	Understand the concept of Artificial Intelligence, search techniques and knowledge representation issues						
CO2	Understanding reasoning and fuzzy logic for artificial intelligence						
CO3	Students will be able to learn defuzzification and fuzzy measures						
CO4	Students will be able to learn the applications of fuzzy logic and hybrid soft computing techniques						

UNIT I – INTRODUCTION

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models - important technologies - applications. Fuzzy logic: Introduction - crisp sets- fuzzy sets - crisp relations and fuzzy relations: cartesian product of relation - classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Genetic algorithm- Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts.

UNIT II - NEURAL NETWORKS

McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto- associative memory network, hetero-associative memory network, BAM, hop field networks, iterative auto associative memory network & iterative associative memory network – unsupervised learning networks: Kohonen self organizing feature maps, LVQ – CP networks, ART network.

UNIT III - FUZZY LOGIC

Membership functions: features, fuzzification, methods of membership value assignments- Defuzzification: lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic - extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

UNIT IV - HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS

Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems – simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

References:

- Elaine Rich and Kevin Knight “Artificial Intelligence”, 2nd Edition, Tata Mcgraw-Hill, 2005.
- Stuart Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd

Edition, Prentice Hall, 2009.
Text book(s) and/or required material
1. T1. Kliryvan- Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fussett- fundamental of Neural network Prentice Hall , First Edition. Reference Books: 1. Bart Kosko, ―Neural network and Fuzzy System‖ - Prentice Hall-1994.
2. J.Klin and T.A.Folger, ―Fuzzy sets‖ University and information- Prentice Hall -1996.
3. J.M.Zurada, ―Introduction to artificial neural systems‖-Jaico Publication house,Delhi 1994.
4. VallusuRao and HayagvnaRao , ―C++ Neural network and fuzzy logic‖-BPB and Publication, New Delhi,1996.
5. Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/16

ECO-15	Statistics and Operational Research						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	The Objective of the paper is to introduce the basic concepts of Operational Research and linear programming to the students						
CO2	Student will be able to learn and apply different methods to solve Linear Programming Problem.						
CO3	Student will be able to learn moments, standard deviation ,correlation ,regression						
CO4	Students will be able large sample test for single proportion ,difference of means, difference of proportions						

UNIT-I

Basics of Operational Research: Origin & Development of Operational Research, Definition and Meaning of Operational Research, Different Phases of an Operational Research Study, Scope and Limitations of Operational Research, Mathematical Modeling of Real Life Problems.

UNIT-II

Linear Programming Problem: Formulation, solution by Graphical Method, Theory of Simplex Method, Simplex Algorithm, Two phase Method, Charnes-M Method, Degeneracy,

UNIT-III

Basic Statistics: Measures of Central tendency: Mean, median, quartiles, mode, Geometric mean, Harmonic mean, Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, Skewness and Kurtosis, Correlation, Coefficient of correlation, methods of calculations, Lines of regression, Rank correlation.

UNIT-IV

Test of significance: Basic terminology, large sample test for single proportion, difference of proportions, single mean, difference of means, Small samples test for single mean, difference of means, Chi-square test for goodness of fit

References /Suggested Readings:

1. G. Hadley: Linear Programming. Narosa, Reprint, 2002.
2. G. Hadley: Linear Algebra, Narosa, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 9th Edition,2010.
6. Ravindran, D. T. Phillips and James J. Solberg: Operations Research- Principles and Practice, John Wiley & Sons, 2005.

F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata

Mc-Graw Hill, 2010.

ECO-16	Mixed Signal Design						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	This course teaches how in real life applications both analog and digital circuits can be implemented for various system design.						
Course Outcomes							
CO1	To know basics and working of various Switched-Capacitor Circuits.						
CO2	To understand various PLL circuits.						
CO3	To gain knowledge on various D/A and A/D converters.						
CO4	To apply knowledge of different architectures in mixed signal circuits for real life problems.						

Unit-I

Switched-Capacitor Circuits

Introduction to Sampling Switches: MOSFETS as switches, speed considerations, precision considerations, charge injection cancellations. Switched-Capacitor Amplifiers: Unity Gain Sampler-Buffer, Noninverting Amplifier, Precision Multiply-by-Two Circuit. Switched-Capacitor Integrator, Switched-Capacitor Common-Mode Feedback.

Unit- II

Phase Locked Loop

Characterization of a comparator, basic CMOS comparator design, analog multiplier design, PLL-simple PLL, charge-pump PLL, Applications of PLL

Unit- III

D/A Converter

Sample-and-Hold Characteristics, DAC Specifications, DAC Architectures: Digital input Code, Resister Steering, R-2R Ladder Networks, Current Steering, Charge-Scaling DACs, Cyclic DACs, Pipeline DACs.

Unit- IV

A/D Converter

ADC Specifications, ADC Architectures: Flash, The Two-Step Flash ADC, The Pipeline ADC, Integrating ADCs, The Successive Approximation ADC, The Oversampling ADC. Applications of DACs and ADCs.

TEXT BOOKS:

1. Jacob Baker, "CMOS circuit design, layout and simulation", John Wiley India.
2. Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002.

REFERENCE BOOKS:

1. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition.
2. Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons, 1986.
3. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition

ECO-17	Blockchain Technology						
Lecture (Hrs.)	Tutorial (Hrs.)	Practical (Hrs.)	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3Hr
Course Outcomes							
CO1	Understand how blockchain systems (mainly Bitcoin and Ethereum) work						
CO 2	To securely interact with them						
CO 3	Design, build, and deploy smart contracts and distributed applications						
CO 4	Integrate ideas from blockchain technology into their own projects.						

Unit I

Basics: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II

Blockchain: Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III

Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

2. Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

ECP-10	Fiber Optic Communications						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	**Students will be able to understand the structure of fiber and the mechanism of light travelling in the fiber.**						
CO2	**Students will be able to analyze various losses associated with fibers.**						
CO3	**Students will learn about the optical sources and optical detecters.**						
CO4	**Students will be able to understand the various components and devices required in making optical networks**						

UNIT – I

INTRODUCTION : Optical Fibers: Structure, Propagation within the fiber, Numerical aperture of fiber, acceptance angle, step index and graded index fiber, Modes of propagation in the fiber, Single mode and multi mode fibers. Splices and connectors. Optical Power Launching and Coupling. Fiber-to-fiber joints.

UNIT –II

LOSSES IN OPTICAL FIBER : Attenuation, Absorption Losses, Scattering Losses, Leaky modes, Mode coupling losses, Bending Losses, Combined Losses in the fiber.

DISPERSION EFFECT : Effect of dispersion on the pulse transmission Intermodal dispersion, Material dispersion, Wave guide dispersion, Polarization Mode Dispersion, Total dispersion, Transmission rate. Dispersion Shifted Fibers, Dispersion Compensating Fibers.

UNIT – III

LIGHT SOURCES : LEDS, Laser Action in semiconductor Lasers, Semiconductor Lasers for optical communication – Laser modes, Spectral Characteristics, Power Voltage Characteristics, Frequency response.

DETECTORS : P-I-N Photodiode, APD, Noise Analysis in detectors, Coherent and non-coherent detection, Infrared sensors. Bit error rate.

UNIT – IV

The fiber-optic Communication System: Design considerations of fiber optic systems: Analog and digital modulation. Optical Devices: Optical coupler, space switches, linear divider-combiners, WDM: strategy, wavelength division multiplexer and demultiplexer, optical amplifier

OPTICAL NETWORKS: Elements and Architecture of Fiber-Optic Network, Optical link network-single hop, multihop, hybrid and photonic networks.

Suggested Books:

John Power, An Introduction to Fiber optic systems, McGraw Hill International.
John Gowar , Optical communication Systems.
R. Ramaswamy, Optical Networks, Narosa Publication
John M. Senior,Optical Fiber Communication
Gerd Keiser, Optical Fiber Communication

ECP-11	Mobile Communication and Networks						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	-	-	3	75	25	100	3 Hrs.
Course Outcomes (CO) To expose the students to the most recent technological developments in Mobile communication systems..							
CO1	To familiarize the students with the fundamental concepts of wireless, cellular technology And signal propagation in mobiles						
CO2	Students will able to learn the detail knowledge of GSM and GPRS.						
CO3	After this unit students will understand the wireless access techniques and standards						
CO4	Students will understand the concept of mobile receivers.						

UNIT-I

Cellular concepts: Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards.

Signal propagation: Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models

UNIT-II

Mobile System and Network Architectures GSM Services and Features – GSM system Architecture, GSM radio subsystem, Frame structure for GSM, Signal processing in GSM, GPRS Network architecture, GPRS services and features, 3G UMTS network architecture, UMTS services and features.

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UNIT-III

Wireless Standards Multiple access techniques: FDMA, TDMA and CDMA, Wireless networking, Design issues in personal wireless systems, Cordless systems and Wireless Local Loop (WLL), IEEE 802.16 Fixed Broadband Wireless Access standard, Mobile IP and Wireless Application protocol**.**

UNIT-IV

Receiver structure: Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme.

Text Books

1. Rappaport, T.S., "Wireless Communications", Principles and Practice, Prentice Hall, NJ, 1996.
2.William Stallings, "Wireless Communication and Networking", Pearson Education, 2002.

ECP – 12	Adaptive Signal Processing						
Lecture	**Tutorial**	**Practical**	**Credit**	**MajorTest**	**MinorTest**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
CourseOutcomes							
CO1	To understand various stochastic processes and models in adaptive signal processing.						
CO2	To understand the analysis of wiener filters, the concept of the linear prediction and steepest descent algorithms.						
CO3	To use Least-Mean-Square (LMS) & Recursive Least-Squares (RLS) algorithms for specific engineering problems.						
CO4	To apply the concept robustness and analysis the Finite-Precision effects on LMS and RLS algorithms.						

Unit -I

Stochastic Processes and Models: Partial Characterization of a Discrete-Time Stochastic Process, Mean Ergodic Theorem, Correlation Matrix, Correlation Matrix of Sine Wave Plus Noise, Stochastic Models, Wold Decomposition, Asymptotic Stationarity of an Autoregressive Process, Yule—Walker Equations.
Wiener Filters: Linear Optimum Filtering: Statement of the Problem, Principle of Orthogonality, Minimum Mean-Square Error, Wiener-Hopf Equations, Error-Performance Surface, Multiple Linear Regression Model.

Unit -II

Linear Prediction: Forward Linear Prediction, Backward Linear Prediction, Levinson-Durbin Algorithm, Properties of Prediction-Error Filters, Schur-Cohn Test.
Method of Steepest Descent: Basic Idea of the Steepest-Descent Algorithm, The Steepest-Descent Algorithm Applied to the Wiener Filter, Stability of the Steepest-Descent Algorithm, Example, The Steepest-Descent Algorithm as a Deterministic Search Method, Virtue and Limitation of the Steepest-Descent Algorithm.

Unit -III

The Least-Mean-Square (LMS) Algorithm: Signal-Flow Graph, Optimality Considerations, Applications, Statistical Learning Theory, Transient Behavior and Convergence Considerations, Efficiency.
The Recursive Least-Squares (RLS) Algorithm: Some Preliminaries, The Matrix Inversion Lemma, The Exponentially Weighted RLS Algorithm, Selection of the Regularization Parameter, Update Recursion for the Sum of Weighted Error Squares, Example: Single-Weight Adaptive Noise Canceller.

Unit -IV

Robustness: Robustness, Adaptation, and Disturbances, Robustness: Preliminary Considerations Rooted in H∞ Optimization, Robustness of the LMS Algorithm, Robustness of the RLS Algorithm, Comparative Evaluations of the LMS and RLS Algorithms from the Perspective of Robustness.

Finite-Precision Effects: Quantization Errors, Least-Mean-Square (LMS) Algorithm, Recursive Least-Squares (RLS) Algorithm, Summary and Discussion.

TEXT BOOKS:

1. S. Haykin, Adaptive filter theory,Pearson

REFERENCE BOOKS:

1. T. Adali and S. Haykin, Adaptive Signal Processing, WileyIndia
2. B. Widrow and S.D. Stearns, Adaptive signal processing, PrenticeHall.

ECP-13	NANO ELECTRONICS							
Course No.	**Course Title**	**Teaching Schedule**			**Allotment of Marks**			**Duration of Exam (Hrs.)**
		L	**T**	**P**	**Major Test**	**Minor Test**	**Total**	
		3	**0**	**0**	**75**	**25**	**100**	**3**
Course Outcomes								
CO 1	Students will Understand the basic physics behind the nanoelectronics devices							
CO 2	Students be able learn various classification of the nano-materials.							
CO 3	To Understand various fabrication methods of nonmaterials.							
CO 4	Students will learn to characterize various nanomaterials using various characterization tools.							

UNIT-I

Introduction to nanotechnology, Impacts, Limitations of conventional microelectronics, Trends in microelectronics and optoelectronics, Mesoscopic physics, trends in microelectronics and optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence

UNIT- II

Classification of Nano structures, Low dimensional structures Quantum wells, wires and dots, Density of states and dimensionality, Basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells.

UNIT-III

Introduction to methods of fabrication of nanomaterials, different approaches, physical vapour deposition, chemical vapour deposition, Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide-dry and wet oxidation methods.

UNIT-IV

Introduction to characterization of nanostructures, tools used for of nano materials characterization: Principle of operation of Scanning Tunnelling Microscope, Atomic Force Microscope, Scanning Electron microscope, Transmission Electron Microscope.

Text Books:

1. J.M. Martinez-Duart, R.J. Martin Palma, F. Agulle Rueda Nanotechnology for Microelectronics and optoelectronics, Elsevier, 2006
2. W.R. Fahrner, Nanotechnology and Nanoelctronics, Springer, 2005

References:

1. Chattopadhyay, Banerjee, Introduction to Nanoscience & Technology, PHI, 2012
2. George W. Hanson, Fundamentals of Nanoelectronics, Pearson Education, 2009.
3. K. Goser, P. Glosekotter, J. Dienstuhl, Nanoelectronics and nanosystems, Springer 2004.
4. Murty, Shankar, Text book of Nanoscience and Nanotechnology, Universities Press, 2012.
5. Poole, Introduction to Nanotechnology, John Wiley, 2006.
6. Supriyo Dutta, Quantum Transport- Atom to transistor, Cambridge, 2013.

ECP-14	Microwave Theory and Techniques						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	Learner will be able to mathematically design basic resonator cavities and will be able to measure microwave parameters such as impedance, frequency and VSWR etc						
CO2	Learner will learn the conventional methods to generate the microwaves.						
CO3	Learner will know about the importance of scattering parameters along with its applications in the analysis of basic microwave components.						
CO4	Learner will learn about transferred electron and avalanche transit time devices in detail.						

UNIT-I

Introduction to Microwaves-History of Microwaves, Microwave Frequency bands, Applications of Microwaves: Civil and Military, Medical, EMI/ EMC, Effect of Microwaves on Human Body.
Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave Transmission.
Review of waveguides in brief, Coaxial Transmission Line, Strip line, Microstrip line.
Microwave Resonators: Cavity Resonators: Rectangular, Cylindrical, and Coaxial, Excitation and Coupling of cavities, Q factor.

UNIT-II

Microwave Measurements: Measurement of frequency, impedance (using slotted section) Attenuation, power, dielectric constant, measurement of V.S. W. R., Insertion loss and Permeability.
Microwave Generators: Construction, characteristics, operating principle and typical applications of Klystron(two cavity, multicavity), Reflex Klystron, Magnetron(Cylindrical magnetron and description of Πmode applications) and Traveling Wave Tube(TWT).

UNIT-III

Matrix Description of Microwave Circuits: Scattering Matrix: properties, measurement of scattering coefficients, scattering matrices for common microwave systems.
Passive and Active Microwave Devices- Microwave passive components: Directional Coupler, Power Divider, E Plane and H-Plane Tee, Magic Tee, Attenuator, Isolators, Circulator and Phase Shifter.
Microwave Active Components: Diodes, Transistors, Design Considerations of Filters, Amplifiers, Oscillators and Mixers (in Brief).

UNIT-IV

Solid State Microwave Devices: Transferred Electron Devices-Gunn Diode: Negative Differential Resistance Phenomenon, High Field Domain Formation. Avalanche Transit Time Devices: IMPATT, TRAPATT, BARITT diodes, Tunnel Diode, PIN Diode, Parametric amplifiers
Text Book: David M. Pozar, Microwave Engineering, John Wiley and sons Inc.
Reference Books:

1. Samuel Y. Liao, Microwave Devices and Circuits, Prentice-Hall of India.
2. Das. Annapurna & Sisir K. Das, Microwave Engineering, Tata McGraw-Hill.
3. R.E. Collins, Microwave Circuits, McGraw Hill.

ECP-15	EMBEDDED SYSTEMS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time(Hrs)**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3**
Course Outcomes							
At the end of the course students will be able to							
CO1	Acquire knowledge about different types of Microcontrollers and various Embedded System design examples of real- life problems.						
CO2	Understand the PIC, AVR, ARM and SHARC architectures.						
CO3	Understand different types of I/O devices, Timer Devices and Communication Interfaces.						
CO4	Acquire knowledge about the design of RTOS and various operating systems.						

UNIT I

INTRODUTION: Different types of Microcontrollers, 4-bit, 8-bit, 16-bit, and 32-bit Microcontrollers, Processor Architectures: Harvard & Princeton, CISC & RISC, Microcontrollers Memory Types, Microcontrollers Features, Criteria for Choosing a Microcontroller, Applications of Microcontrollers, Embedded System**:** Definition, Embedded Processors; Hardware Units, Devices and Software Tools in a System, Embedded System on Chip, Complex Systems Design and Processors, Design Challenges, Design Process and Design Examples.

UNIT II

PIC MICROCONTROLLER: Introduction to PIC16 Microcontroller Family, Features of PIC16C74, Architecture and Pin diagram of PIC16C74, Pipelining, Program Memory Considerations, Register File Structure, Addressing Modes, Instruction Sets; Advanced Architectures**:** Only Brief General Architecture of AVR, ARM and SHARC.

UNIT III

COMMUNICATION INTERFACES: I/O Devices Types and Examples, Serial Communication Devices, Parallel Device Ports, Wireless Devices, Timer and Counting Devices, Distributed Networked Embedded System Architecture, Serial Bus Communication Protocols-I^2C, CAN, USB, FireWire and Advanced Buses; Parallel Bus Device Protocols- ISA, PCI, ARM and Advanced Buses; Network Protocols- HTTP, TCP, UDP, IP and Ethernet; Wireless and Mobile System Protocols- IrDA, Bluetooth, 802.11 and Zigbee; Device Drivers.

UNIT IV

RTOS: Architecture of Kernel, Processes, Threads, Task and Thread States, Task and Data, Distinction Between Function, ISR, IST and Task; Semaphores, Mutex, Event Registers, Pipes, Signal, Timers, Memory Management, Priority Inversion Problem, Disabling and Enabling Function, Queues and Mailboxes, Pipe and Sockets Functions;

Basic Design using a RTOS, RTOS Task-Scheduling Model, OS Standards: POSIX, Off- the-Shelf Operating System, Embedded Operating Systems, Real –Time Operating Systems, Handhold Operating Systems.

Text Books:

1. Raj Kamal, "Embedded systems architecture, programming and design", 3rd Ed., McGraw-Hill

Companies.
2. John. B. Peatman, "Design with PIC Microcontroller", Pearson Education, 2003.
3. Dr. K.V.K.K. Prasad, "Embedded/Real-Time Systems: Concepts, design and programming", DreamTech Press.

References Books:

1. Myke Predko, "Programming and Customizing the 8051 Microcontroller", TMH.
2. M.A. Mazidi, R. D. McKinlay,Causey," The PIC microcontroller and Embedded Systems using assembly and C for PIC18", 2nd Ed., Pearson.
3. D.P. Kothari, Shriram K. Vasudevan, Sundaram R. M. D., Murali N., "Embedded System", New Age International (P) Limited, Publishers.
4. Shibu K V, "introduction to Embedded Systems", 2nd Ed., McGraw Hill Education(India) private Limited.

Note: Separate question paper template will be provided to the paper setter for setting the question paper of end term semester examinations.

ECP-16	ROBOTICS						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time(Hrs)**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3**
Course Prerequisites	Transducers and Microprocessors.						
Course Objectives	To enlighten the students about the fundamentals of robotic systems.						
Course Outcomes							
At the end of this course the student should be able to understand							
CO1	The basic concepts related to the Robot, parts of Robots, End Effectors and to make familiar with the various Drive systems for Robot.						
CO2	The operation of various Sensors and their Applications in Robots.						
CO3	The Machine Vision and its Applications, and various Control Systems used in Robots.						
CO4	The Robot Programming, Artificial Intelligence, Fuzzy Logic, Safety Standards of Robots and Industrial and Non-Industrial applications of Robots.						

UNIT I

FUNDAMENTALS OF ROBOT: Definition, History and Development in Robot Technology, Robot Technology: Characteristics, Basic Components, Robot Anatomy, Robot Generations, Robot Selection, Present and Future Applications.

ROBOTS DRIVE SYSTEMS AND END EFFECTORS: Robot Classification: Arm Geometry, Degrees of Freedom, Power Sources, Types of Motion, Path Control; Robot End Effectors: Mechanical Grippers, Vacuum, Magnetic, Adhesive; Special Purpose Grippers, Process Tooling, Compliance, Robot Drive Systems: Hydraulic, Pneumatic and Electric System.

UNIT II

SENSORS : Requirements of a Sensor, Sensor Classification; **Principle, Advantages, Disadvantages and Applications of the following Sensors**: Position Sensors - Potentiometer, Encoder, LVDT, Resolvers, LMDT and Hall–Effect Sensors; Velocity Sensors: Encoder, Tachometer and Differentiation of position signal; Acceleration Sensors, Force, Pressure Sensors: Piezoelectric, Force Sensing Resistor, Strain Gauge and Antistatic Foam; Torque Sensors, Micro Switches, Visible Light and Infrared Sensors, Touch and Tactile Sensors, Proximity Sensors: Magnetic, Optical, Ultrasonic, Inductive, Capacitive and Eddy Current; Range Finder: Ultrasonic, Light-base and GPS; Sniff Sensors, Taste Sensors, Vision Sensors, Voice Recognition Devices, Voice Synthesizers, RCC.

UNIT III

MACHINE VISION AND CONTROL SYSTEM: Visual Sensing, Architecture of Robotics Vision System, Machine Vision: Image Acquisition - Vidicon Tube and CCD; Digitization, Image Processing: Spatial Domain Operations, Noise Reduction and Edge Detection etc.; Image Analysis: Object Recognition by Features-Template Matching, Discrete Fourier Descriptors and Computed Tomography; Depth Measurement with Vision System, Image Interpretation, Segmentation by Region Growing and Region Splitting, Image Data Compression, Machine Vision Application, Other Optical Methods; Control Systems: Basic Robot Control System, PLC, PID, CNC, MPU, and URC.

UNIT IV

ROBOT PROGRAMMING, ARTIFICIAL INTELLIGENCE AND ROBOTS APPLICATIONS: Robot Programming: Programming Methods and Languages, Levels of Robot Programming, Space Position Programming, and Program Statements; Elements of Artificial Intelligence, System Architecture; Fuzzy Logic Control, Application of Fuzzy Logic in Robotics; Robot Safety, Safety Standards; Industrial Applications:

Automation in Manufacturing, Robot Applications: Material Handling, Processing Application, Assembly Application and Inspection Application; Evaluating the Potential of a Robot Application, Future Applications, Challenge, Innovations; Non-Industrial Application.

Text Books:

1. James G. Keramas, "Robot technology fundamentals", Delmar Publishers.
2. Saeed B. Niku, "Introduction to robotics analysis, control and applications", 2nd ed., Wiley India.
3. R. K. Mittal, I. J. Nagrath, "Robotics and Control", TMH Education Pvt.

Note: Separate question paper template will be provided to the paper setter for setting the question paper of end term semester examinations.

ECP-17	Digital Image Processing					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes						
CO1	Student will be able to explain basic concepts of image processing					
CO2	Student will be able to design evaluate image enhancement techniques					
CO3	Student will be able to analyze various compression and morphological operations					
CO4	Student will be able to describe various video processing systems					

Unit – I

Digital image processing fundamentals: Introduction, Image processing applications, Fundamental Steps in Digital Image Processing, Image Sampling and Quantization, Relationships between pixels, Color Fundamentals, color models.

Unit - II

Image Enhancement: Basics of intensity Transformations, Histogram processing, Spatial Domain filtering – Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering.

Frequency Domain Filtering- Sampling and Fourier Transform of sampled functions, 2-D Sampling, Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

Unit - III

Image Compression: Fundamentals, Image Compression models, Error Free Compression – Huffman Coding, Arithmetic Coding, LZW Coding, Lossy Compression – Block transform coding.

Morphological Image Processing: Introduction, Erosion and Dilation, Opening and Closing, Hit or Miss Transformations, Boundary Extraction. Image Segmentation: Fundamentals of image segmentation, Point, Line, and Edge Detection.

Unit - IV

Video Processing: video formation, Video Frame classifications- I, P and B frames, Application of motion estimation in video coding, Patterns and Pattern classes - Recognition based on matching.

Text Books:

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2018.

Reference Books:

1.Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011

2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.

3. M. Tekalp, Digital Video Processing. Signal Processing Series, Prentice Hall, 1995.

4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.

Note: Question paper template will be provided to the paper setter.

ECP-14L	Microwave Communication Lab						
Lecture (Hrs.)	Tutorial (Hrs.)	Practical (Hrs.)	Credit	Practical	Minor Test	Total	Time
-	-	4	2	60	40	100	3 Hrs.

Course Outcomes (CO)

To give the students an idea about the study and analysis of components used in Microwave Engg.

CO1	Students will learn the steps to analyze microwave components.
CO2	Students will be able to find the characteristics of microwave components.
CO3	Students will learn the steps to analyze various antennas.
CO4	Students will be able to find the characteristics of various antennas.

List of Experiments:

1. To study microwave components.
2. To study the characteristics of the reflex Klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working in TE 10 mode.
4. To determine the standing wave ratio and reflection coefficient.
5. To study the I-V characteristics of gunn diode.
6. To study the magic Tee.
7. To study the isolator and attenuator.
8. To measure the coupling coefficient and directivity of a waveguide directional coupler.
9. To measure the polar pattern and the gain of a waveguide horn antenna.
10. To measure the insertion loss and attenuation.

ECP-15L	Embedded Systems Lab						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO) **To give the students an idea about the 8051/PIC/AVR/ARM microcontrollers**							
CO1	To familiarization with 8051, PIC, AVR and ARM Microcontrollers.						
CO2	Ability to write an embedded C language and assembly language program for 8051, PIC and AVR Microcontrollers.						
CO3	Ability to interfacing the various Peripheral to 8051, PIC and AVR Microcontrollers.						
CO4	Ability to design the embedded systems based on 8051, PIC and AVR Microcontrollers.						

List of Experiments

1. Write an embedded C program using 8051/PIC/AVR Microcontroller for interfacing DC motor to rotate clockwise and anticlockwise directions.
2. Write an embedded C program using 8051/PIC/AVR Microcontroller for interfacing stepper motor to rotate clockwise and anticlockwise directions.
3. Write an embedded C program using 8051/PIC/AVR Microcontroller for interfacing LCD to display message "WELCOME" on LCD screen.
4. Write an embedded C program using 8051/PIC/AVR Microcontroller for interfacing a switch and a buzzer at two different pins of a Port such that the buzzer should sound as long as the switch is pressed.
5. Write an embedded C program using 8051/PIC/AVR Microcontroller for interfacing keypad to port P0.Whenever a key is pressed; it should be displayed on LCD screen.
6. Write an embedded C program using 8051/PIC/AVR Microcontroller for interfacing LEDs to glow them in different pattern.
7. Write an embedded C program for 8051/PIC/AVR Microcontroller to display 0 to 9 on 7 segment display.
8. Write an embedded C program using 8051/PIC/AVR Microcontroller for interfacing RTC module to display current date and time on LCD screen
9. Write an embedded C program using 8051/PIC microcontroller for interfacing temperature sensor LM35 to display the current temperature on LCD screen.
10. Design an embedded system for traffic light controller using 8051/PIC Microcontroller

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ECP-16L	Robotics lab						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO): **To expose the students to the most recent technological developments in industrial Robot.**							
CO1	**To familiarization with FIRE BIRD Robot.**						
CO2	**Abilities to interfacing various peripherals.**						
CO3	**Student will be able to write embedded C language programming..**						
CO4	**Ability to design the automatic system for robotics based application.**						

List of Experiments:

1. To get familiar with the AVR Studio 4.17 IDE and Fire Bird Robot.
2. Write a program for I/O interfacing to sense the pressing of push button Switch.
3. Write a program to alternately blink the set of LED
4. Write a program to display two digit numbers on LCD.
5. Write a program for obstacle detection of Robot
6. Write a program for controlling the speed of Fire Bird Robot.
7. Write a program for PWM based speed control of motor.
8. Write a program to design white line Follower Robot
9. To implement and design social distancing indicator and alarming system.
10. To Study implement the temperature based Fan speed controller.

ECP-17L	Digital Image Processing Lab						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO) **To give the students an idea about the study and analysis of digital image processing**							
CO1	Students will be able to explain the basics of Digital Image processing						
CO2	Student will be able to explain sampling and quantization of digital image.						
CO3	Student will be able to analyze the image enhancement operations on digital image.						
CO4	Students will be able to analyze various image analysis and computer vision algorithm						

List of Experiments

1. Study of Image processing toolbox of MATLAB.
2. WAP to read and show various images of at least five different formats.
3. WAP to extract R, G, B component of Color Image.
4. WAP to convert a color image into gray scale and save it in new format.
5. WAP to invert a gray scale image.
6. WAP to implement Morphological operations on an image.
7. WAP to implement Histogram equalization.
8. WAP to implement various edge detection algorithms.
9. WAP to implement image segmentation.
10. WAP to implement boundary extraction of basic structure.

ECP-18	Wireless & Mobile Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	0	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, propagation methods, and multi access techniques used in the mobile communication.						
Course Outcomes							
CO 1	It deals with the fundamental cellular radio concepts and generations of modern wireless communication.						
CO 2	This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.						
CO 3	It provides idea about Multiple access techniques used in wireless communication.						
CO 4	It presents different ways to Wireless Standards and mobility management.						

Unit–I

Introduction to Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Unit–II

Introduction to Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Unit– III

Multiple Access Techniques for Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Unit-IV

Wireless Standards-GSM, IS-95, UMTS-IMT-2000, Signaling, Call Control, Mobility Management and location Tracing.

Suggested Books:

1. Theodore S.Reppeport, Wireless Communications Principles and Practice, IEEE Press, Prentice Hall.

2. William C.Y.Lec, Mobile Cellular Telecommunications, Analog and Digital Systems, Mc-Graw Hill Inc.

3 Kamilo Feher, Wireless Digital Communications, Modernization & Spread Spectrum Applications, Prentice Hall of India, New Delhi.

4 Kaveh Pahlavan and Allen H. Levesque " Wireless Information Networks", Wiley Series, John Wiley and Sons Inc.

ECP-19	Bio-Medical Signal Processing						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	-	-	**3**	**75**	**25**	**100**	**3**
Purpose	**To understand the concept of Bio-Medical Signal Processing.**						
Course Outcomes **At the end of this course, student will be able to**							
CO 1	Interpret signals and systems						
CO 2	Acquire Biomedical Signals such as ECG						
CO 3	Apply adaptive filtering algorithms in biomedical applications						
CO 4	Analyze different kinds of events and waveforms of biomedical origin						

Unit – I

Signals and Information: Definitions and properties of Laplace transform, Basic of DFT and FFT, z-transform, Sampling theorem.
Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, frequency response, group delay, phase delay, Applications of Digital Signal Processing.

Unit – II

Introduction to Biomedical Signal: General measurement and diagnostic system, classification of signals, introduction to biomedical signals, Biomedical signal acquisition and processing.
ECG: ECG signal origin, ECG parameters-QRS detection different techniques, ST segment analysis, Arrhythmia, Arrhythmia analysis, Arrhythmia monitoring system.

Unit – III

Adaptive Filtering: Introduction, General structure of adaptive filters, LMS adaptive filter, adaptive noise cancellation, cancellation of ECG from EMG signal, Cancellation of maternal ECG in fetal ECG.
EEG: EEG signal characteristics, Sleep EEG classification and epilepsy.

Unit – IV

Event Detection and waveform analysis: Need for event detection, Detection of events & waves, Correlation analysis of EEG signals, Identification of heart sounds, Morphological analysis of ECG waves.
Frequency Domain Analysis: Introduction, Spectral analysis, linear filtering, Removal of high frequency noise (power line interference), motion artifacts (low frequency) and power line interference in ECG.

Text Book:

1. Biomedical Signal Analysis" A case study approach, Rangaraj M Rangayyan, John Wiley publications.

Reference Books:

1. "Biomedical Signal Processing Time and Frequency Domains Analysis (Volume I)", Arnon Cohen, CRC press.
2. "Biomedical Signal Processing Principles and Techniques" D.C.Reddy, Tata Mc Graw-Hill
3. "Biomedical Digital Signal Processing", Willis J. Tompkins, PHI

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ECP-20	Machine Learning					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes						
CO1	Recite and understand the knowledge of classification and associated algorithms					
CO2	Explain and apply algorithms of statistical pattern recognition and supervised Learning					
CO3	Explain, implement and apply algorithms of non-parametric learning, feature extraction and selection					
CO4	Understand, explain and apply un-supervised learning, estimation and comparison of different classifiers					

UNIT-I

Classification: The Classification Process, Features, Training and Learning, Supervised Learning and Algorithm Selection, Approaches to Classification, Examples.

Nonmetric Methods: Introduction, Decision Tree Classifier, Information, Entropy, Impurity, Information Gain, Decision Tree Issues, Strengths and Weaknesses, Rule-Based Classifier, Other Methods.

UNIT-II

Statistical Pattern Recognition: Measured Data and Measurement Errors, Probability Theory, Simple Probability Theory, Conditional Probability and Bayes' Rule, Naive Bayes Classifier, Continuous Random Variables, The Multivariate Gaussian, The Covariance Matrix, The Mahalanobis Distance.

Supervised Learning: Parametric and Non-parametric Learning, Parametric Learning, Bayesian Decision Theory, Discriminant Functions and Decision Boundaries, MAP (Maximum A Posteriori) Estimator.

UNIT-III

Nonparametric Learning: Histogram Estimator and Parzen Windows, k-Nearest Neighbor (k-NN) Classification, Artificial Neural Networks, Kernel Machines.

Feature Extraction and Selection: Reducing Dimensionality, Preprocessing, Feature Selection, Inter/Intraclass Distance, Subset Selection, Feature Extraction, Principal Component Analysis, Linear Discriminant Analysis.

UNIT-IV

Unsupervised Learning: Clustering, k-Means Clustering, Fuzzy c-Means Clustering, (Agglomerative) Hierarchical Clustering.

Estimating and Comparing Classifiers: Comparing Classifiers and the No Free Lunch Theorem , Bias and Variance, Cross-Validation and Resampling Methods: The Holdout Method , k-Fold Cross-Validation, Bootstrap, Measuring Classifier Performance, Comparing Classifiers, ROC Curves, McNemar's Test, Other Statistical Tests, The Classification Toolbox, Combining Classifiers.

Text/References Books:

1. Geoff Dougherty: Pattern Recognition and Classification An Introduction, 2013, Springer.

2. Christopher M. Bishop: Pattern Recognition and Machine Learning, Springer.

ECP-21	Artificial Intelligence						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**

Course Outcomes	
CO1	To familiarize the students with the fundamental concepts of Artificial Intelligance.
CO2	Students will able to learn the detail knowledge of Supervised and Unsupervised Learning.
CO3	After this unit students will be able to understand the concepts of Genetic Algorithm and Object Detection and Tracking
CO4	Students will be able to understand the concept of Artificial Neural Networks and reinforcement learning.

UNIT-I

Introduction to Artificial Intelligence, need of AI, Applications of AI, Branches of AI, Defining intelligence using Turing Test, Classification, Preprocessing data, Label encoding, Logistic Regression classifier, Naïve Bayes classifier, Support Vector Machines.

UNIT-II

Regression, Building a single variable regressor, Building a multivariable regressor, Supervised and Unsupervised Learning, Detecting Patterns with Unsupervised Learning, Clustering data with K-Means algorithm, Estimating the number of clusters with Mean Shift algorithm,

UNIT-III

Genetic Algorithms, Fundamental concepts in genetic algorithms, Generating a bit pattern with predefined parameters Object Detection and Tracking: Frame differencing, Tracking objects using colorspaces, Object tracking using background subtraction, Face detection and tracking, Eye detection and tracking.

UNIT-IV

Artificial Neural Networks, Building a Perceptron based classifier, Constructing a single layer neural network, Constructing a multilayer neural network, Reinforcement Learning, Reinforcement learning versus supervised learning, Building blocks of reinforcement learning.

Text Book:

1. Introduction to Artificial Intelligence by Philip C. Jackson · 1974

Reference Book:

2. Artificial Intelligence by Chris Neil · 2020
3. Artificial Intelligence with Python by Prateek Joshi.

ECP -22	Internet of Things						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes							
CO1	Understand what IoT technologies are used for today, and what is required in certain scenarios.						
CO2	Understand the types of technologies that are available and in use today and can be utilized to implement IoT solutions.						
CO3	Understand the type of protocols and challenges for designing IoT systems.						
CO4	Apply these technologies to tackle scenarios in teams of using an experimental platform for implementing prototypes and testing them as running applications. Understand operating system requirements of IOT.						

Unit 1

Introduction to IoT: Defining IoT, Characteristics of IoT, Functional blocks of IoT, Physical and logical design of IoT, Smart cities and IoT revolution, ,Difference between IoT and M2M, M2M and peer networking concepts Ipv4 and IPV6, Software Defined Networks SDN,

Unit 2

Developing IoTs: IoT design methodology, case study on IoT system for weather monitoring. IoT system Management,

Developing IoT applications through embedded system platform: Introduction to sensors, IoT physical devices and endpoints, Raspberry pi, Raspberry pi interfaces, Arduino, arduino interfaces.

Unit 3

Protocols for IoT- messaging protocols, transport protocols, Ipv4, Ipv6, URI, Cloud for IoT: IoT with cloud, challenges, introduction to fog computing, cloud computing,

Challenges in IoT: Design challenges, development challenges, security and legal considerations.

Unit 4

Logic design using Python: Introduction to python, data types, data structures, control flow, functions, modules, file handling and classes., implementing IotT concepts with python,

Applications of IoT, Connected cars IoT Transportation, Smart Grid and Healthcare sectors using IoT,

References:

1) A Bahaga, V. Madisetti, “Internet of Things- Hands on approach”, University press, 2014.
2) S.K.Vasudevan, A.S.Nagarajan, “Internet of Things”, Wiley, 2019.
3) CunoPfister, “Getting started with Internet of Things”, Maker Media, 1st edition, 2011. Samuel Greenguard, “Internet of things”, MIT Press, 2015.

Web resources:

1) http://www.datamation.com/open-source/35-open-source-tools-for-the-internet-of-things-1.html
2) https://developer.mbed.org/handbook/AnalogIn
3) http://www.libelium.com/50_sensor_applications
4) M2MLabs Mainspring http://www.m2mlabs.com/framework Node-RED http://nodered.org/

ECP-23	Error Correcting Codes					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes						
CO1	Student will be able to evaluate linear codes					
CO2	Student will be able to evaluate cyclic codes					
CO3	Student will be able to evaluate BSH and RS codes					
CO4	Student will be able to evaluate convolution codes					

Unit- I

Basic concepts of linear codes: Three fields, linear codes , generator and parity matrix, dual codes, weights and distances, puncturing codes, extending c odes, shortening codes, direct sums,permutation equivalent codes, Golay codes, RM Codes

Unit- II

Cyclic Codes: polynomials and euclidean algorithm, primitive elements, finite fields, subfields, field automorphism. clotomic cosets and minimal polynomials, factoring x^n -1, zeros of cyclic code, minimum distance of cyclic codes.

Unit -III

BCH and RS codes: BCH codes, RS Codes, generalized RS codes, decoding BCH codes,burst error, concatenated and interleaving codes.

Unit-IV

Convolution codes: generator matrices and encoding, veterbi decoding: state diagram, trellis, diagram and viterbi algorithm, canonical generator matrices, free distance.
Soft decision and iterative decoding: AWGN, soft decision viterbi decoding, general viterbi algorithm, two way app decoding.

Text Books:
1.W. Cary Huffman, Fundamentals of Error-Correcting Codes by Cambridge University Press

Reference Books:
1. Ranjan Bose, Information Theory and Coding, McGraw Hill
2. W. Wesley Peterson and E. J. Weldon, *Error-Correcting Codes, The MIT Press*

Note: Question paper template will be provided to the paper setter.

ECP-24	Satellite Communication						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Satellite communication and various terms, laws and multiple access schemes used in its working.**						
Course Outcomes							
CO1	**To understand the concept of basics of satellite communication and various basic laws and terms of satellite communication.**						
CO2	**To understand the concept and processes of various communication satellites used in satellite communication.**						
CO3	**To familiarize with the concept and design issues of satellite link design and satellite access.**						
CO4	**To familiarize with the concepts of Multiple access schemes used in satellite communication.**						

Unit -I

SATELLITE ORBITS: Orbital Mechanics- Kepler's laws ,locating the satellite in the Orbit, locating the satellite with respect to the earth, Orbital elements, look angle determination, Sub satellite point, Azimuth and elevation angle calculation, Orbital perturbations, Longitudinal and Inclination changes; Launches and launch vehicles-ELV's, Placing the satellite into geostationary orbit, Doppler shift, range variations, solar eclipse, sun transit outage.

Unit -II

COMMUNICATION SATELLITES: Satellite Subsystems, Attitude and Orbit Control system(AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power System, Communication Subsystems-description, Transponders, satellite antennas-basic antenna types, basic antennas in practice.

Unit -III

Satellite link design and Satellite access: Basic transmission theory**,** system noise temperature and G/T ratio; Downlink design-link budget; Uplink design; design for specified C/N, uplink and downlink attenuation in rain, communication link design procedure; system design examples.

Unit –IV

Multiple access schemes: FDMA, TDMA, CDMA, DAMA; VSAT systems-basic techniques, VSAT earth station engineering, system design; DBS systems-C-band and Ku band home TV, digital DBS; satellite mobile systems; GPS

Text Books:

1. Timothy Pratt, Satellite Communications, Wiley India edition

Reference Books:

2. Anil K Maini, Satellite Communication, Wiley India edition.
3. Siegmund M. Redl, Mathias K. Weber, Malcolm W. Oliphant, "An Introduction to GSM", Artech House Publishers, 1995.
4. Kraus, J.D., "Antennas", II Edition, John Wiley and Sons, NY, 1977. 5. Collin, R.E. and Zucker, F., - "Antenna theory: Part I", Tata McGraw Hill, NY, 1969.

ECP-25	High Speed Electronics						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hour**
Course Outcomes							
CO 1	**Understand significance and the areas of application of high-speed electronics circuits.**						
CO 2	**Understand the properties of various components used in high speed electronics**						
CO 3	**Design High-speed electronic system using appropriate components.**						
CO 4	**To be able to understand the effect of scaling on high speed VLSI circuits.**						

UNIT-I

Transit time of charge carriers, junction capacitances, ON-resistances and their dependence on the device geometry and size, carrier mobility, doping concentration and temperature. Contact resistance and interconnection/interlayer capacitances in the Integrated Electronics Circuits.

UNIT-II

Introduction to high-speed digital design: Frequency, time and distance - Capacitance and inductance effects - High seed properties of logic gates - Speed and power - Modelling of wires -Geometry and electrical properties of wires - Electrical models of wires - transmission lines - lossless LC transmission lines - lossy LRC transmission lines

UNIT-III

Devices: Passive and active, Lumped passive devices, Active : low frequency and high frequency models RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers and Power Amplifiers, Class A, B, AB and C, D, E .

UNIT-IV

Impact of scaling on High Speed VLSI Circuit, Inter-Die Variation, Intra-Die Variation, Fail Causes Optimization Techniques for High Speed VLSI: Mathematic Optimization, Circuit optimization, CAD tool for optimization

Books:

1. Stephen H. Hall, Garrett W. Hall, James A. McCall “High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices”, August 2000, Wiley-IEEE Press
2. . Kerry Bernstein & et. al., High Speed CMOS Design Styles, Kluwer, 1999
3. William S. Dally & John W. Poulton; Digital Systems Engineering, Cambridge University Press, 1998
4. Howard Johnson & Martin Graham; High Speed Digital Design: A Handbook of Black Magic, Prentice Hall PTR, 1993
5. Masakazu Shoji; High Speed Digital Circuits, Addison Wesley Publishing Company, 1996
6. William S. Dally & John W. Poulton; Digital Systems Engineering, Cambridge University Press, 1998
7. Howard Johnson & Martin Graham; High Speed Digital Design: A Handbook of Black Magic, Prentice Hall PTR, 1993
8. Thomas H. Lee, “The Design of CMOS Radio-Frequency Integrated Circuits”, CambridgeUniversity Press, 2004, ISBN 0521835399.
9. Behzad Razavi, “RF Microelectronics”, Prentice-Hall 1998, ISBN 0-13-887571-5.
10. Guillermo Gonzalez, “Microwave Transistor Amplifiers”, 2nd Edition, Prentice Hall.

11. Kai Chang, “RF and Microwave Wireless systems”, Wiley.
12. R.G. Kaduskar and V.B.Baru, Electronic Product design, Wiley India, 2011 Course Outcomes:

ECP-26	Software Defined Radio						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**-**	**-**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To understand the underlying principles of Software Defined Radios and Cognitive Radio Networks.**						
Course Outcomes							
CO1	Understand the principles behind the Software Defined Radios over the conventional Cognitive Radios						
CO2	Ability to analyze Software Defined Networking protocols and cognitive radio techniques						
CO3	Understand the data traversal over SDN						
CO4	Design algorithms for Software Defined Radio and cognitive radio environments						
CO5	Understand the various types of key routing and switching techniques used in adaptive networks.						

UNIT I

SOFTWARE DEFINED RADIO CONCEPTS

Need for Software Radios - Characteristics and Benefits of a Software Radio - Design Principles of a Software Radio - RF Receiver Front-End Topologies - Importance of the Components to Overall Performance - Transmitter Architectures and Their Issues - Noise and Distortion in the RF Chain ADC and DAC Distortion - Flexible RF Systems

UNIT II

SDR AS A PLATFORM FOR COGNITIVE RADIO

Hardware Architecture: Baseband Processors - Hardware Architecture: Multi-Core Systems - Software Architecture: Design Philosophies - GNU Radio - Software Communications Architecture - Application Software - Component Development - Waveform Development - Cognitive Waveform Development

UNIT III

COGNITIVE RADIO: TECHNOLOGIES REQUIRED

Software Capable Radios - Software Programmable Radios - SDR Examples - Aware Adaptive and CRs - Radio Capabilities and Properties Comparison - Spectrum Awareness and Frequency Occupancy - Software Technology - Funding and Researches in CRs - Directions and Standards

UNIT IV

OBJECT ORIENTED REPRESENTATION OF RADIOS

Introduction to Network Resources - Network Resources - Object Oriented Programming - Object Request Broker Architecture - Object Brokers and Software Radios - Mobile Application Environments - Security in Software Radios - Joint Tactical Radio Systems - SCA Architectures.

REFERENCES

1. Software Radio: A Modern Approach to Radio Engineering By Jeffrey H. Reed Pearson Education Low Price Edition

2. “Cognitive Radio Technology”, Bruce A Fette, Academic Press, 2009

3. Cognitive Radio Networks by Wyglinski, Alexander M. Nekovee, Maziar, Hou, Y. Thomas, 2010 Elsevier.

4. “Cognitive Radio, Software Defined Radio and Adaptive wireless system, Huseyin Arslan , Springer, 1 edition ,September 24, 2007

ECP-18L	Wireless Communication Lab						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**

Course Outcomes (CO)

To give the students an idea about the Wireless communication theory and technology using the NI-Labview software and RF communication module.

CO1	To study the wireless communication using NI-Labview
CO2	To learn about the functioning of Universal Software Radio Peripheral (USRP)
CO3	To learn the implementation of different analog modulation schemes using the USRP
CO4	To learn the implementation of different digital modulation schemes using the USRP.

List of Experiments:

1. Introduction to NI-LabVIEW and familiarization with its basic functions.
2. Study of modulation toolkit and its usage in Wireless Communication.
3. Study the interfacing of hardware (USRP module) with the PC and configuring the same.
4. Implementation of AM using Software Defined Radio (SDR).
5. Implementation of FM using SDR with application such as transfer of files
6. Implementation of M-PSK transmitter using SDR concept.
7. Implementation of M-PSK receiver using SDR
8. Implementation of M-QAM transmitter using SDR.
9. Demonstrates the use of the Bluetooth functions to set up data transfer via Bluetooth between a server VI and a client VI.
10. Design two-dimensional convolution to perform image edge detection.
11. Implementation of M-QAM receiver using SDR.
12. Implementation of PSK Modulation system with Convolutional Coding.
13. Implementation of FSK Modulation system with BCH Coding.
14. Implementation of QAM Modulation system with Golay Coding

ECP-19L	Biomedical lab						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO) **At the end of the course, student will be able to**							
CO1	**Elaborate various biomedical signals**						
CO2	**Acquire and simulate ECG ,EMG and EEG biomedical signals**						
CO3	**Simulate ECG Pulse missing detector**						
CO4	**Demonstrate the functions of defibrillator and pacemaker**						

List of Experiments:

1. Familiarization of various biomedical signals.
2. To simulate Electrocardiogram Waveform
3. To simulate Electroencephalogram Signal
4. To simulate Electromyogram Signal
5. To Simulate Defibrillator
6. To simulate Pacemaker
7. To simulate Haemodialysis Machine
8. To simulate Biopotential Amplifier
9. To simulate ECG Pulse missing detector.
10. To simulate 12 Lead ECG Signals.

ECP-20L	Machine Learning Lab						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO) **At the end of the course, student will be able to**							
CO1	Elaborate machine learning fundamentals						
CO2	Implement different classification/regression algorithms						
CO3	Design and develop artificial neural networks for different applications						
CO4	Develop clustering algorithms						

List of Experiments:

1. To get familiarize with machine learning.
2. Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in MATLAB/Python/Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for

clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add MATLAB/Java/Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. MATLAB/Java/Python ML library classes can be used for this problem

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

ECP-21L	Artificial Intelligence Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical**	**Minor test**	**Total**	**Time**
0	**0**	**4**	**2**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes **At the end of the course student will be able to**							
CO1	Implement AND/OR&NOT gate using single layer perception						
CO2	Implement XOR gate using multilayer perception						
CO3	Demonstrate the function of fuzzification/defuzzification processes						
CO4	Demonstrate different case studies in the domain						

List of Experiments:

1. Implementation of AND/OR/NOT Gate using Single Layer Perceptron
2. Implementation of XOR Gate Using Multi-Layer Perceptron/ Error Back Propagation
3. Implementation of XOR Gate Using Radial Basis Function Network
4. Understanding the concepts of Perceptron Learning Rule
5. Understanding the concepts of Hebbiann Learning Rule
6. Understanding the concepts of Correlation Learning Rule
7. Understanding the working of Kohonen's Self Organising Maps
8. Understanding the functioning of Fuzzification process
9. Implementation of different method of Defuzzification process
10. Case study explaining function of Fuzzy Inference System
11. Case study explaining function of Optical Character Recognition

ECP-22L	Internet of Things Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical**	**Minor test**	**Total**	**Time**
-	**0**	**4**	**2**	**60**	**40**	**100**	**3 Hr.**
Course Outcome: Students will be able to get the idea of Internet of Things technology.							
CO1	**Student will be able to get familiarize with Arduino and Raspberry Pi**						
CO2	**Student will be able to implement interfacing different sensorss with Arduino and Raspberry Pi**						
CO3	**Student will be able to understand the concept of cloud**						
CO4	**Student will be able to design module based on Internet of Things application**						

List of Experiments

1. Familiarization with concept of IoT, Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/ Buzzer using relay with Arduino/Raspberry Pi and write a program to turn ON/OFF LED/Buzzer.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed.
4. To interface Analog sensors(Temperature/Humidity/ Ultrasonic) with Arduino/Raspberry Pi and write a program to display sensors data on the computer screen.
5. To interface OLED with Arduino/Raspberry Pi and write a program to print sensor data on it.
6. To interface sensor with Arduino/Raspberry Pi and write a program to turn ON/OFF Relay when sensor data is detected.
7. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON/OFF motor when push button is pressed.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data on smart phone using Bluetooth.
9. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when a 1/0 is received from smartphone using Bluetooth.
10. Write a program to upload sensor data on cloud.
11. Write a program to retrieve sensor data from cloud.

Components required-

1. Arduino with cable
2. Raspberry Pi with cable and memory card
3. Node MCU
4. Sensors-IR, LDR, DHT11 sensor, Push button, Pressure senser, Temperature sensor, Vibration, Rotation, Location, Torque, Sound, Weight etc.
5. Actuators-LED, Buzzer, Relay Switch, Motors, Motor Drivers, OLED, Display, Linear Actuator,
6. Bluetooth Module, Wi-fi Module, Ethernet Module
7. Smart Phone
8. Computer
9. Power Supply-5V, 12V, 3.3V
10. Internet facility

ECP-23L	Augmented Reality/Virtual Reality Lab						
Lecture (Hrs.)	**Tutorial (Hrs.)**	**Practical (Hrs.)**	**Credit**	**Practical**	**Minor Test**	**Total**	**Time**
-	**-**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO) **To expose the students to the most recent technology i.e. Augmented Reality and Virtual Reality.**							
CO1	**Student will be able to familiarization of basics of Augmented Reality and Virtual Reality**						
CO2	**Student will be able to Design 3D Objects**						
CO3	**Student will be able to get an idea about the Vuforia .**						
CO4	**Student will be able to design Game in Unity 3D Project.**						

List of Experiments

1. To get familiarization with the basics of AR/VR
2. Introduction to Unity 3D, and its game objects, materials, cameras, standard assets, asset store, adjusting size, position and rotation of game objects .
3. Program to Design 3D Modelling, Importing 3D models in Unity 3D, and to add buttons.
4. Program to Design of animating 3D models, adding material to 3d models
5. Program to Design User Interface using Unity 3D and customizing the colour, size, background, text etc. of the UI elements
6. To learn about Scripting, Adding scripts to game objects, controlling objects with scripts, button functionality with scripting.
7. Program to design Prefabs/Physics Elements, Creating prefabs, adding physics to game objects.
8. To learn about Vuforia SDK, Vuforia integration with Unity 3D, selecting a perfect image for AR development.
9. To design 2D game on Unity 3D
10. To learn about Scene Management in Augmented Reality Applications, MultiScene Arrangement in Augmented Reality Applications

Note: the above mentioned experiments are not limited. Teacher may introduce new experiments

Department of Tourism and Hotel Management
Kurukshetra University, Kurukshetra

Under
Faculty of Commerce and Management,
Kurukshetra University, Kurukshetra

PROGRAMME TITLE

MASTER OF HOTEL MANAGEMENT
&
CATERING TECHNOLOGY
(MHM&CT)

Under
(CBCS / LOCF)

w.e.f
Session: 2020-2022

Program Outcomes for the Faculty of Commerce and Management

On successful completion of a program under Faculty of Commerce and Management, students will be able to develop:

PO1. Soft skills and Working Skills: To comprehend, communicate and execute effectively and efficiently in all of their dealings.

PO2. Leadership: To develop abilities to both lead and respect the views, positions and beliefs of others and to plan and manage effectively

PO3. Innovativeness and Entrepreneurship: To explore issues and problems that needs solutions with entrepreneurial orientation

PO4. Ethics and Values: To recognize, appreciate and follow ethical standards in all walks of life

PO5. Adaptability and Sociability: Ready to understand and adapt the changing environment.

P06. Research and Analytical abilities: To Explore, analyses and provide solutions on emerging issues concerning various fields including public policy.

PO7. Practical exposure and Employability: Exposure to actual working environment leading to employability

PO8. Environmental Consciousness: In every action, dealing, service and manifestation

Programme Specific Objectives (PSO)
of
MHM &CT Programme

PSO 1To prepare students for entry level / middle managerial positions in hotels / allied areas (such as food & beverage service outlets; retails outlets; event / MICE companies; Tourism services companies; entertainment; hospitality academics etc.)

PSO 2 Knowledge of hotel functions & management

PSO 3Ability to work in different departments of the hotels / allied areas (such as food & beverage service outlets; retails outlets; event / MICE companies; Tourism services companies; entertainment hospitality academics etc.)

PSO 4Apply standard hotel management practices to operational & managerial work requirements.

PSO 5 Becoming socially responsible hotel professional

Master of Hotel Management & Catering Technology Programme
(MHM&CT Programme)
under
(CBCS / LOCF)

A postgraduate degree in Master of Hotel Management & Catering Technology Programme (MHM&CT Programme) under Choice based credit system (CBCS / LOCF) will be awarded if the student complete **12 Core courses / papers in the discipline, 02 AECC courses, 3 SEC courses and 13 DSE courses / papers.**

Proposed syllabus Structure of Master of Hotel Management & Catering Technology Programme (MHMCT Programme) under CBCS / LOCF

Semester	**CORE COURSE(CC) @6CREDITS**	**Ability Enhancement Compulsory Courses(AECC) @2 CREDITS**	**Skill Enhancement Courses (SEC) @2 CREDITS**	**Discipline Specific Elective (DSE) @6 CREDITS**
1	CC-MHMCT-1	AECC-MHMCT-1	SEC-MHMCT-1	DSE-MHMCT-1
	CC-MHMCT-2		SEC-MHMCT-2	DSE-MHMCT-2
				DSE-MHMCT-3
				DSE-MHMCT-4
2	CC- MHMCT-3	AECC-MHMCT-2	SEC-MHMCT-3	DSE-MHMCT-5
	CC- MHMCT-4			DSE-MHMCT-6
				DSE-MHMCT-7
3	CC- MHMCT-5 A			DSE-MHMCT-8
	CC- MHMCT-5 B			DSE-MHMCT-9
	CC- MHMCT-5 C			DSE-MHMCT-10
	Or			DSE- MHMCT-11
	CC- MHMCT-5 D			
	CC- MHMCT-5 E			
	CC- MHMCT-5 F			
	CC- MHMCT-6			
4	CC- MHMCT-7A			DSE-MHMCT-12
	CC- MHMCT-7B			DSE-MHMCT-13
	CC- MHMCT-7 C			
	Or			

	CC- MHMCT-7 D			
	CC- MHMCT-7 E			
	CC- MHMCT-7 F			
	Or			
	CC- MHMCT-7 G			
	CC- MHMCT-7H			
	CC- MHMCT-7 I			
	CC- MHMCT-8			

AECC will be offered according to the time table adjustments in the University Teaching Department /College.
*MOOC Course from Swayam portal

General instructions:

1. One credit equivalent to 1 hour of teaching / 2 hours of Practical work
2. One credit (teaching /Practical) equivalent to 20 marks

Total credit hours for Master of Hotel Management & Catering Technology Programme (MHMCT Programme) under Choice based credit system (CBCS / LOCF)

Course	Number of courses	Contact hrs	Credits
Core Course (CC)	**12**	**6 (6x12=72)**	**72**
Ability Enhancement compulsory course (AECC)	**2**	**2 (2x2=4)**	**4**
Skill Enhancement course (SEC)	**3**	**6 (3x2=6)**	**6**
Discipline Specific Elective Course (DSE)	**13**	**6 (13x6=78)**	**78**
Total	**30**	**160**	**160**

MHM & CT

(Detail Syllabus)

w.e.f

Session: 2020-2022

Department of Tourism and Hotel Management
Kurukshetra University, Kurukshetra

Programme- MHM&CT -2 Years
w.e.f
Session: 2020-2022

Semester I										
Course Code		**Course Title**	**T**	**P/ Tu.**	**C**	**Max Marks**			**Total Marks**	**Pass Marks**
						Internal	T	P		
CC- MHMCT-1	**A**	**Front Office Operations (Theory)**	4	0	4	16	64	-	80	32
	B	**Front Office Operations (Practical)**	0	4	2	08	-	32	40	16
CC- MHMCT-2	**A**	**Housekeeping Operations (Theory)**	4	0	4	16	64	-	80	32
	B	**Housekeeping Operations (Practical)**	0	4	2	08	-	32	40	16
DSC-MHMCT-1		**Introduction to Hotel Industry**	5	1	6	20	80	-	100	40
DSC-MHMCT-2		**Fundamental of Management in Hotels**	5	1	6	20	80	-	100	40
DSC-MHMCT-3		**Hygiene, Sanitation & Medical Protocols**	5	1	6	20	80	-	100	40
DSC-MHMCT-4		**Tourism Business**	5	1	6	20	80	-	100	40
SEC-MHMCT-1		**ICT in Hotels**	2	-	2	8	32	-	40	16
SEC-MHMCT-2		**Hotel French –I**	2	-	2	8	32	-	40	16
AECC-MHMCT-1		**Communication Skills in Hotels**	2	0	2	08	32	-	40	16
			34	**12**	**42**				**760**	

T-Theory, P- Practical, C-Credits, AECC - Ability Enhancement Compulsory Course, Skill Enhancement Course (SEC), Discipline Specific Elective (DSE)

Semester II										
Course Code		**Course Title**	**T**	**P**	**C**	**Max Marks**			**Total Marks**	**Pass Marks**
						Internal	T	P		
CC- MHMCT- 3	**A**	**Food Production (Theory)**	4	0	4	16	64	-	80	32
	B	**Food Production (Practical)**	0	4	2	08	-	32	40	16
CC- MHMCT-4	**A**	**Food & Beverage Service (Theory)**	4	0	4	16	64	-	80	32
	B	**Food & Beverage Service (Practical)**	0	4	2	08	-	32	40	16
DSE-MHMCT- 5		**Hotel Laws**	5	1	6	20	80	-	100	40
DSE-MHMCT-6		**Basics of Event Management**	5	1	6	20	80	-	100	40
DSE-MHMCT-7		**Service Marketing**	5	1	6	20	80	-	100	40
SEC- MHMCT-3		**Hotel French –II**	2	-	2	8	32		40	16
AECC-MHMCT-2		**Environmental Practices in Hotels**	2	-	2	8	32	-	40	16
			27	**11**	**34**				**620**	

T-Theory, P- Practical, C-Credits, AECC - Ability Enhancement Compulsory Course, Skill Enhancement Course (SEC)

03 MONTHS VOCATIONAL TRAINING / HOTEL INDUCTION TRAINING

Semester III

Course Code		Course Title	T	P	C	Max Marks			Total Marks	Pass Marks
						Internal	T	P		
DSE-MHMCT-8		**HRM in Hotels**	5	1	6	20	80	-	100	40
DSE-MHMCT-9		**Entrepreneurship and Innovation in Hotels**	5	1	6	20	80	-	100	40
DSE-MHMCT-10		**Customer Relationship Mgt.**	5	1	6	20	80	-	100	40
DSE-MHMCT-11		**Financial management in hotels**	5	1	6	20	80	-	100	40
OPTIONAL SPECIALIZATION (any one cluster)										
Specialization in Room Division										
CC-MHMCT-5	**A**	**Advance Accommodation Management**	5	1	6	20	80	-	100	40
	B	**Advance Front Office Management**	5	1	6	20	80	-	100	40
	C	**Management of Housekeeping in Allied Sectors**	5	1	6	20	80	-	100	40
Or		**Specialization in Food & Beverage Service Management**								
CC-MHMCT-5	**D**	**Specialized Catering Management**	5	1	6	20	80	-	100	40
	E	**F& B Control Management**	5	1	6	20	80	-	100	40
	F	**Bar operation & Management**	5	1	6	20	80	-	100	40
COMPULSORY										
CC- MHMCT-6		**Training Report & Viva- voce examination**	-	-	12				300	
			35	**7**	**54**				**1000**	

T-Theory, P- Practical, C-Credits, SEC – Skill Enhancement Course

Semester IV (Specialization)										
Course Code		**Course Title**	**T**	**P / Tu.**	**C**	**Max Marks**			**Total Marks**	**Pass Marks**
						Internal	T	P		
DSE- MHMCT-12		**Research Methodology**	5	1	6	20	80	-	100	40
DSE- MHMCT-13		**Decision Science in Hotels**	5	1	6	20	80	-	100	40
Optional Specialization (any one cluster)										
Specialization (Event Management)										
CC-MHMCT-7	**A**	**Event Product & Logistics Planning**	5	1	6	20	80	-	100	40
	B	**MICE Events Planning & Management**	5	1	6	20	80	-	100	40
	C	**Specialized Events in Hotels**	5	1	6	20	80	-	100	40
Or		**Specialization (Hotel Marketing)**								
CC-MHMCT-7	**D**	**Hotel Marketing Research**	5	1	6	20	80	-	100	40
	E	**Sales Management in Hotels**	5	1	6	20	80	-	100	40
	F	**Digital and Social Media Marketing**	5	1	6	20	80	-	100	40
Or		**Specialization (Human Resource)**								
CC-MHMCT-7	**G**	**Strategic HRM**	5	1	6	20	80	-	100	40
	H	**Training & Development in Hotels**	5	1	6	20	80	-	100	40
	I	**Employee Motivation and Welfares in Hotel**	5	1	6	20	80	-	100	40
Compulsory										
CC-MHMCT-8		**Dissertation in the area of specialization in Semester IVth & Viva Voce**	**-**	**-**	**12**	**-**	**-**	**-**	**300**	
			25	**5**	**42**				**800**	

T-Theory, P- Practical, C-Credits, Core, SEC- Skill Enhancement Course

TOTAL SEMESTERS & CREDITS

Marks Distribution	Sem 1	Sem 2	Sem 3	Sem 4	Total
Credits allocated	42	34	54	42	172
Marks in Each Sem	760	620	1000	800	3,180
Grand Total Marks	3,180				
Grand Total credits	172				

SEMESTER I

CC-MHMCT-1 (A) FRONT OFFICE OPERATIONS (THEORY)
Credits –04
External Marks -64
Internal Marks -16

Total Marks-80

COURSE OBJECTIVES:

Co 1: Examining importance of front office and guest cycle.
Co 2: Understanding the function, handling of situations and key control.
Co 3: Summarizing organizational structure of front office and its coordination.
Co 4: Memorizing guestrooms, tariff and guest cycle.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration)

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 12 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions

UNIT-I	**Hotel Front Office:** Introduction, importance in hotel, Layout of the front office department **Guest Cycle:** Pre-Arrival, Arrival, Occupancy, Departure, Post Departure. Room tariff and room rates.	**CO 1**
UNIT-II	**Role and function:** Reception, reservation, registration and method of payment **Handling Various:** Complaints and emergency situations **Keys and key control:** Types of keys, handling guestroom keys and its control	**CO 2**
UNIT-III	**Guest Departure and Guest Accounting:** Folio, Ledgers, settlement of accounts, handling vouchers, Express check out and group departures, Message and left luggage handling procedure **Cash and Credit Control**	**CO 3**
UNIT-IV	**Front Office Cashier** Role of the Front desk cashier, Importance of front office cash, Duties and responsibilities of front desk cashier. **Night Auditing:** Introduction, Objective, functions and job description of Night Auditor, Night Audit process, Preparing night audit reports.	**CO 4**

SUGGESTED TEXT BOOKS

- Andrews, S. (2017). Hotel Front Office: A Training Manual. McGraw Hill Education; Third edition.
- Bhatnagar, S. K. (2011). Front Office Management. Frank Bros.
- Tewari, J. (2016). Hotel Front Office: Operations and Management. Oxford University Press; Second edition.

SUGGESTED REFERENCE BOOKS

- Gonda, M. C. (2015). Handbook of Attire & Grooming. Embassy Books; First edition.
- Kasavana, L. M, Cahil, J. J (1992). Managing Computers in the Hospitality Industry. Educational Institute of the Amer Hotel; 2nd edition
- Smart Family (2018). All Countries, Capitals and Flags of the World!.CreateSpace Independent Publishing Platform.
- Bardi, A. J. (2012). Hotel Front Office Management. Wiley India Pvt Ltd; Fifth edition.
- Bhakta, A. (2011). Professional Hotel Front Office Management. McGraw Hill Education.
- Kasavana, L. M. (2000). Managing Front Office Operations. Educational Institute of the American Hotel & Motel Association; 5th edition edition
- Woods, H. R., Ninemeier, J. D., Hayes, D. K. and Austin, M. A (2013). Professional Front Office Management: Pearson New International Edition, Pearson Education Limited; illustrated.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE
CC-MHMCT-1 (A)

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	1	1	2	2	1	3	1
Co 2	1	2	1	2	2	1	3	1
Co 3	1	1	2	1	1	1	2	1
Co 4	1	1	1	1	1	2	3	1
	1.25	1.25	1.25	1.5	1.5	1.25	2.75	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE CC-MHMCT-1(A)

Mapping: CO-PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	3	2	2	2
Co 2	2	3	2	3	2
Co 3	2	3	2	2	1
Co 4	3	3	2	3	1
	2.25	3	2	2.5	1.5

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE CC-MHMCT-1 (A)

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	1	1	2	2	1	3	1	2	3	2	2	2
Co 2	1	2	1	2	2	1	3	1	2	3	2	3	2
Co 3	1	1	2	1	1	1	2	1	2	3	2	2	1
Co 4	1	1	1	1	1	2	3	1	3	3	2	3	1
	1.25	1.25	1.25	1.5	1.5	1.25	2.75	1	2.25	3	2	2.5	1.5

CC-MHMCT-1 (B) FRONT OFFICE OPERATIONS (PRACTICAL)

Credits –02
External Marks -32
Internal Marks -08
Total Marks-40

- Grooming Standards of front office personnel
- Attributes and qualities of for new entrants/employees in the front office
- Basic front office terminology.
- Forms and Formats
- Skills to handle telephones
- Handling various category of guests, with children, business travellers, single woman traveller, differently abled travellers
- Familiarization with first aid kit and its contents.

CC- MHM&CT-2 (A) HOUSEKEEPING OPERATIONS (THEORY)

Credits –04
External Marks -64
Internal Marks -16

TotalMarks-80

COURSE OBJECTIVES:

CO1 Identify the elements involved in the managing of accommodation operations
CO2 Develop the skills and knowledge of the handling housekeeping operations
CO3 Familiarize with linen room management in hotels
CO4 Ability to handle emergency situations and security and safety of guest during stay in the hotel.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration)

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 12 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions

UNIT- I	**MANAGING HOUSEKEEPING OPERATIONS** • Role of Housekeeping in Guest Satisfaction and Repeat Business. • Calculating standard time taken for performing tasks – productivity standards • Frequency schedules • Job Allocation • Work Schedules • Duty rosters • Work study • Ergonomics in housekeeping	**CO1**
UNIT- II	CLEANING ORGANISATION AND ROUTINE SYSTEMS OF HOUSE KEEPING DEPARTMENT • Principles of cleaning • hygiene and safety factors in cleaning • Methods of organising cleaning • Frequency of cleaning daily, periodic, special Furniture/ Fixtures/ Reporting Staff placement • Room Occupancy Report • Guest Room Inspection	**CO2**

	• Entering Checklists, Floor Register Work Orders, Log Sheet. • Lost and Found Register and Enquiry File • Maid's Report and Housekeeper's Report • Handover Records • Guest's Special Requests Register • Record of Special Cleaning • Call Register • VIP Lists • Handling over at end of the shift	
UNIT-III	**LINEN ROOM MANAGEMENT** • Activities of the linen room • Location, planning and layout of the linen room • Linen items used in the hotel • Selection criteria for various linen items • Calculation of linen requirements • Purchase of linen • Linen cycle and linen control • Daily routine control of linen procedures and records • Stocktaking procedures and records • Recycling of discarded linen • The importance of providing uniforms to staff • Selection and design of uniforms • Issuing and exchange of uniforms Procedures and records • Planning the layout of the uniform room • Activities of the sewing sections • Areas and equipment to be provided	**CO3**
UNIT- IV	HANDLING EMERGENCY SITUATIONS AND TRENDS • Safety awareness and accident prevention –Procedure to be followed in the event of an accident. • Illness and First Aid procedures to combat the illness • Death of a guest • Fire Safety – detection and fire-fighting Procedure to be followed in the event of fire. • Dealing with emergency situations – bomb threats, natural disasters, etc. • Waste disposal • Related Case Studies • Trends in Housekeeping and front office operations	CO4

SUGGESTED TEXT BOOKS

- Hotel Housekeeping Operations & Management by Raghubalan, Oxford University Press.
- Hotel House Keeping A Training Mannual by Sudhir Andrews, Tata McGraw Hill publishing company limited New Delhi.

SUGGESTED REFERENCE BOOKS

- Hotel Hostel and Hospital Housekeeping by Joan C Branson & Margaret Lennox, ELBS with Hodder & Stoughten Ltd.
- House Keeping Management by Matt A. Casado; Wiley Publications
- Management of Hotel & Motel Security (Occupational Safety and Health) by H. Burstein, CRC Publisher.
- Managing Housekeeping Operations by Margart M. Kappa, CHHE, American Hotel & Lodging Associations.
- Professional management of Housekeeping by Manoj Madhukar, Rajat Publications
- Professional Management of Housekeeping Operations (II Edn.) by Robert J. Martin & Thomas J.A. Jones, Wiley Publications

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE (CC- MHM&CT-2 (A)

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	1	1	2	1	1	2	2
Co 2	1	2	2	1	1	1	2	1
Co 3	1	2	1	1	1	1	2	1
Co 4	1	1	1	2	2	1	1	1
	1	1.5	1.25	1.5	1.25	1	1.75	1.25

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE CC-MHM&CT-2 (A)

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	2	2	2	1
Co 2	3	3	2	2	1
Co 3	3	2	2	2	1
Co 4	2	2	2	2	2
	2.75	2.25	2	2	1.25

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE CC- MHM&CT-2 (A)

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	1	1	1	2	1	1	2	2	3	2	2	2	1
Co 2	1	2	2	1	1	1	2	1	3	3	2	2	1
Co 3	1	2	1	1	1	1	2	1	3	2	2	2	1
Co 4	1	1	1	2	2	1	1	1	2	2	2	2	2
	1	1.5	1.25	1.5	1.25	1	1.75	1.25	2.75	2.25	2	2	1.25

CC- MHM&CT-2 (B) HOUSEKEEPING OPERATIONS (PRACTICAL)
Credits –02

	External Marks -32 **Internal Marks -08** **TotalMarks-40**
• Guest room Orientation (Single, Double, Twin and Suite room) • Guest room supplies and placement (Standard room and VIP amenities) • Soft Furnishing • Introduction to Cleaning equipment and handling • Setting up of Chambermaid's trolley • cleaning agents (familiarization and function) • Cleaning of public areas • Brasso and Silvo • Wooden surfaces- polished, painted, laminated. • Cleaning of glass surfaces • Wall cleaning-Dado/skirting • Procedure for cleaning Bed Rooms & Bathrooms • Evening Service • Bed making (identifying of linen and step by step procedure for a day bed using traditional and modern methods	

DSC- MHM&CT- 1 INTRODUCTION TO HOTEL INDUSTRY

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Knowledge of National and International Hotel Industry and enhance ability to classify various types of hotels.

Co 2 Develop an understanding of functions, organizational structure of major departments in a hotel.

CO3 Recognize different type of rooms and its features.

CO4 Cultivate the attributes and skills required to work efficiently in a hotel. Also recognize the latest trends of hotel industry.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

Unit-I	**INTRODUCTION TO HOTEL INDUSTRY** • Introduction, definition, origin and importance of hospitality industry. A brief history of hotels – India & Abroad • Classification of hotels based on – Location, Size, Type of guest, Length of stay of guest. Ownership basis- Independent Hotels, Affiliation and Accreditation. Ownership basis- Management contracts, Franchise, Chain Hotels. Vacation ownership/Time share and Condominium Hotels with examples of hotel groups involved in this business concept • On the Basis of Star Grading- Star ratings and Heritage Classifications, Government's Classification Committee adopted in India, Basis on	CO 1

	which Star ratings are granted along with the Performa of Star Classification. • **OVERVIEW OF OTHER CONCEPTS-** Spa, Boutique hotels, All Suite, Budget Hotels, Green Hotels, Ecotels etc. • Major hotel chains.	
UNIT- II	**INTRODUCTION TO HOTEL DEPARTMENTS** • Introduction to front of house areas and Back of house areas of Hotel. Organizational structure of star categorized hotels. • Organisational Structure, functions and sections of Front Office, Housekeeping, F & B Service, F & B Production departments. • Functions of ancillary departments- Engineering & Maintenance Department, Human Resource Department, Finance Department, Accounts Department, Marketing & Sales Department, and Material Management & Purchasing Department. • Job analysis of major position (Room Division and F & B Department) • Inter departmental Communication.	**CO 2**
UNIT-III	**GUEST ROOM & PUBLIC AREA FACILITIES** • Types of rooms • Meal Plans (AP, MAP, CP, and EP). • Room Status Terminology • Standard layout (single, double, twin, suite rooms) • Smoking, Non-Smoking & Barrier free rooms • Room Facilities and Room Supplies for standard rooms and VIP guest rooms. • Room Tariff • Public Area Facilities.	**CO 3**
UNIT- IV	**IMPRESSION MANAGEMENT** • **Attribute to work in hotel industry** • Importance of looking presentable & attractive Right dressing & make-up, Hair & inner-glow Poise & Posture Eye-Contact & body language Physical fitness Appearance Speech-vocabulary, pronunciation, diction, voice tone, clarity Body language-verbal, non-verbal, postures, eye-contact etc Emerging trends, latest developments and future of hotel	**CO4**

	industry.	

SUGGESTED TEXT BOOKS

- Food & Beverage Training Manual– Sudhir Andrews (Tata McGraw Hill).
- Front Office Training Manual– Sudhir Andrews (Tata McGraw Hill).
- Housekeeping Training Manual– Sudhir Andrews (Tata McGraw Hill).
- Introduction to Tourism & Hospitality Industry – Sudhir Andrews – TATA Mc Graw Hill

SUGGESTED REFERENCE BOOKS

- Managing Hospitality Operations – Mohinder Chand, Anmol Publications New Delhi.
- Hotel Management-educational & environmental aspects-Yogender K. Sharma
- Hotel, Hostel and Hospital Housekeeping – Joan C Branson & Margaret Lennox
- Introduction to Hospitality-John R.Walker University of South Florida Publisher: Prentice Hall
- Managing Front Office Operations – Kasavana & Brooks

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE DSC- MHM&CT-1

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	1	1	1	1	1	2	1
Co 2	1	1	1	1	1	1	2	1
Co 3	1	1	1	1	1	1	2	1
Co 4	3	2	2	1	3	2	1	1
	1.5	1.25	1.25	1	1.5	1.25	1.75	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSC-MHM&CT- 1

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	2	3	1	1
Co 2	3	3	3	2	1
Co 3	2	3	2	2	1
Co 4	3	2	3	2	1
	2.5	2.5	2.75	1.75	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSC- MHM&CT- 1

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	1	1	1	1	1	1	2	1	2	2	3	1	1
Co 2	1	1	1	1	1	1	2	1	3	3	3	2	1
Co 3	1	1	1	1	1	1	2	1	2	3	2	2	1
Co 4	3	2	2	1	3	2	1	1	3	2	3	2	1
	1.5	1.25	1.25	1	1.5	1.25	1.75	1	2.5	2.5	2.75	1.75	1

DSC-MHMCT-2 FUNDAMENTAL OF MANAGEMENT IN HOTELS

Credits – 04
External Marks - 80
Internal Marks - 20
Total marks – 100

COURSE OBJECTIVES:

Co 1 : Familiarizing with the concept of Management
Co 2 : Integrate planning, decision making & organizing
Co 3 : Talking about staffing, directing & motivation
Co 4 : Explaining leadership & choose various control method

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	CONCEPT OF MANAGEMENT Definition of Management: Art and Science, Management Vs Administration, Levels of Management, Functions of management, Management as a Profession, Management skills, Qualities and characteristics of managers. Evolution of Management thought: Traditional approach - Taylor and Scientific Management, Fayol's Administrative Management, Bureaucracy, Human Relations, and Modern Approach, Social responsibility of managers, Managerial Ethics.	**CO 1**
UNIT- II	PLANNING Concept of planning, Significance of planning, Classification of planning: Strategic plan, Tactical plan and Operational plan, Process of planning, Barriers to effective planning. MBO, Management by Exception. Decision Making: Strategies of decision making, Steps in rational decision making process, Factors influencing decision making process, Psychological bias and decision support system.	**CO 2**

	Organizing: Defining organising, Principles of organising, Process of organising, Types of organizational structure, Span of control, Centralization vs. Decentralization of authority. Informal organization.	
UNIT-III	STAFFING, DIRECTING AND MOTIVATION Staffing: Concept, Objective of staffing, System approach to staffing, Manpower planning. Directing: Concept, Techniques of directing and supervision, Types of supervision, Essential characteristics of supervisor. Motivation: Concept, Forms of employee motivation, Need for motivation. Theories of motivation.	**CO 3**
UNIT-IV	LEADERSHIP AND CONTROL Leadership vs Management, Process of Leadership, Importance of leadership, Characteristics of an effective leader. Controlling: Concept, Importance of controlling, Types of control, Steps in control process.	**CO4**

REFERENCE:

- Weihrich, Heinz, Mark V Cannice & Harold Koontz: Management: A Global and Entrepreneurial Perspective, Tata McGraw –Hill, New Delhi.
- Ghuman, Karminder & K. Aswathappa: Management: Concept, Practice & Case, Tata McGraw – Hill, New Delhi.
- Stoner, Freeman & Gilbert Jr. (2009). Management. New Delhi: Prentice Hall.
- Becker, P.E, The Practices of Management, London, 1955.
- May, D., The Evolution of Management Thought. Ronald Press, New York, 1972.
- Singh, A.N., The Skills of Management, GoverEarnborough, 1980.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE DSE-MHMCT-2

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	3	3	3	3	3	3	3	2
Co 2	3	3	3	3	3	3	3	2
Co 3	3	3	3	3	3	3	3	2
Co 4	3	3	3	3	3	3	3	2
	3	3	3	3	3	3	3	2

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSE-MHMCT-2

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSE-MHMCT-2

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	3	3	3	3	3	3	3	2	3	3	3	3	3

DSC-MHMCT-3 HYGIENE, SANITATION AND MEDICAL PROTOCOLS

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

Co 1: Creating awareness about Hygiene in accommodation and catering Industry
Co 2: Develop sensitivity and high work ethics towards cleanliness and hygiene and the factors that contribute to it.
Co 3 : Develop knowledge towards food hygiene and safety aspects
Co 4: Construct management practices and WHO guidelines

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**HYGIENE AND SANITATION IN HOSPITALITY SECTOR** Hygiene, Sanitation, meaning, uses in hotel industry Importance of hygiene and sanitation in catering industry Personal hygiene for staff members in the hotels and special emphasis on those coming in contact with the guest GHP for commodities, equipment, work area and personnel Cleaning and disinfection (Methods and agents commonly used in the hospitality industry)	**CO 1**
UNIT-II	**Premises and Equipment care** Design of premises Indoor environment management Protective clothing, selection, efficiency, comfort, care and maintenance. Pest control Air, Water and waste Disposal	**CO 2**

UNIT-III	**FOOD SAFETY** Basic Introduction To Food Safety General Principles of Food Hygiene kitchen Hygiene Food Hygiene Regulations, Food Safety Act Food Hazards & Risks, Contaminants HACCP & Its terminologies	**CO 3**
UNIT-IV	**MANAGEMENT PRACTICES AND WHO GUIDELINES** Management team to address health threats Recent concern for emerging pathogens Handling cases of illness and pandemic (Covid-19) Guideline & Specifications for tourism & Hotel Industry.	**CO 4**

SUGGESTED TEXT BOOKS

- Food Hygiene- Kavita Ed Marwaha
- Handbook of Hygiene and Public Health- Bedi Y.P.

SUGGESTED REFERENCE BOOKS

- Food and Hygiene- William Tibbles
- Elements of Hygiene and sanitation- Theodore Hough
- Food Hygiene and Sanitation – S. Roday-Hill Publication
- The Essentials of Food Safety and Sanitation- David McSwane, Nancy R. Rue

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE DSC-MHMCT-4

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	2	2	2	2	1	2	2
Co 2	1	1	2	2	2	2	1	3
Co 3	1	1	1	2	2	2	2	2
Co 4	1	1	1	2	2	3	1	2
	1	1.25	1.5	2	2	2	1.5	2.25

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSC-MHMCT-4

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	1	1	1	2
Co 2	2	2	1	1	3
Co 3	2	2	2	2	2
Co 4	1	1	1	2	3
	1.75	1.5	1.25	1.5	2.5

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSC-MHMCT-4

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	1	2	2	2	2	1	2	2	2	1	1	1	2
Co 2	1	1	2	2	2	2	1	3	2	2	1	1	3
Co 3	1	1	1	2	2	2	2	2	2	2	2	2	2
Co 4	1	1	1	2	2	3	1	2	1	1	1	2	3
	1	1.25	1.5	2	2	2	1.5	2.25	1.75	1.5	1.25	1.5	2.5

DSC- MHM&CT-4 TOURISM BUSINESS

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

Co 1 Knowledge of basic concepts and essentials of Destination
Co 2 Analysis of Tourism Demand & Travel Motivations
Co 3 Identify travel and tourism sector stakeholders and their role
Co 4 Recognize the travel documentations and analyse the future trends

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

Unit-I	**BASIC CONCEPTS OF TOURISM** • Meaning and Definitions Tourism, • Characteristics of Tourism, • Forms & Types of tourism • 5 A's of Tourism • Concept of Destination • Tourism System- Leiper Model • Environmental, Economic, Socio-cultural Impacts of Tourism. • Doxey's Irridex Index- Demonstration Effect • Butler's Tourism Area Life Cycle (TALC)	CO 1
UNIT- II	**TOURISM DEMAND & MOTIVATIONS** • Travel Motivation: Concept • Theory of Travel Motivations • Crompton's Push and Pull Theory • Tourism Demand	**CO 2**

	• Typology of Tourists, Tourist Plog's Allo-centric and Psyco-centric Model of Destination Preferences.	
UNIT-III	**TOURISM SECTOR** Type and Role of following stakeholder in Tourism Industry. • Hospitality • Intermediaries • Transport • Government & Tourism- Major Tourism Schemes of Government of India: Visa on Arrival (VOA), PRASAD Scheme, HRIDAY Scheme, Travel Circuits; Incredible India	**CO 3**
UNIT- IV	**TRAVEL ESSENTIALS** • Travel Documents: Passport, VISA, Health regulations for International tourist, Special permits, Custom Regulations, Emigration and immigration • Crisis management & Tourism • Future Trends and prospects of Tourism	**CO4**

SUGGESTED TEXT BOOKS

- Swain, K.S & Mishra, M.M. (2012). Tourism Principles and Practices. Delhi: Oxford University
- Bhatia A.K. (2002), International Tourism Management, Sterling Publishers, New Delhi.
- Roday. S, Biwal. A & Joshi. V. (2009). Tourism Operations and Management, Oxford University Press, New Delhi.

SUGGESTED REFERENCE BOOKS

- Goeldner, C.R. & Brent Ritchie, J.R. (2006). Tourism, Principles, Practices, Philosophies. John Wiley and Sons, New Jersey.
- Page Stephen J. Brunt Paul, Busby Graham and Cornell .J (2007). Tourism: Modern Synthesis. Thomson Learning. London. U.K.
- Gee, Chuck Y., James C. Makens,, and Dexter J.L. Choy. (1997). The Travel Industry, Van Nostrand Reinhold, New York.
- Youell, R.(1998). Tourism-An Introduction. Addison Wesley Longman, Essex.
- Michael M. Coltman. (1989). Introduction to Travel and Tourism- An International Approach. Van Nostrand Reinhold, New York.
- Burkart A.J., Medlik S. (1992). Tourism - Past, Present and Future. Heinemann, London.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE DSC-4 MHM&CT

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	2	2	1	1	1	3	1
Co 2	1	2	2	1	1	1	3	1
Co 3	1	2	2	1	1	1	3	1
Co 4	2	2	2	1	1	1	3	1
	1.25	2	2	1	1	1	3	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSC-4 MHM&CT

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	1	3	1	1
Co 2	3	1	3	1	1
Co 3	3	2	3	1	1
Co 4	3	1	3	1	1
	3	1.25	3	1	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE DSC-4 MHM&CT

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	1	2	2	1	1	1	3	1	3	1	3	1	1
Co 2	1	2	2	1	1	1	3	1	3	1	3	1	1
Co 3	1	2	2	1	1	1	3	1	3	2	3	1	1
Co 4	2	2	2	1	1	1	3	1	3	1	3	1	1
	1.25	2	2	1	1	1	3	1	3	1.25	3	1	1

SEC-MHMCT-1 ICT IN HOTELS

Credits – 02
External Marks - 32
Internal Marks - 08
Total marks –40

COURSE OBJECTIVES:

Co 1 : Describing Computers; its characteristics & application of computers
Co 2 : Discussing internet, its uses & understanding Word
Co 3 : Practicing Excel & PowerPoint for effective managerial presentation
Co 4 : Planning E-Commerce, its features & different types of ecommerce

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 8 marks (4 short-answer type questions of 2 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 6 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Information to Computers, Characteristics of Computers, applications of Computers in hotel industry, Different unit of Computers, Components of Computers, Input/output and auxiliary storage devices	**CO 1**
UNIT- II	Internet: concepts of Internet, Use of Internet, requirements of Internet, Internet Domain, Internet Server, Establishing Connectivity on the Internet, types of Internet providers, Procedure of Opening E-mail Account on Internet, Browsing the Internet, Internet and Chatting, Internet Phone and Video. **Introduction to MS word** – Creating – Editing – Formatting – Saving documents – Types of document format – Mail Merge features – Parts of MS word window – Features of Ribbons – Using MS word Tools – Spelling and Grammar – Mail merge – Printing Envelops and labels	**CO 2**
UNIT-III	**Introduction of Spreadsheet & excel** - Getting started with excel- Editing cells - Using commands and functions - Moving and copying - Inserting and deleting rows & columns -Getting help and formatting a worksheet - Printing the worksheet - Creating charts - Using date and time - Addressing modes - Naming ranges – Statistical and mathematical functions.-Database in a worksheet – Additional formatting commands and drawing tool bar – Internet usage in Business Email - Multiple worksheets and	**CO 3**

	macros. **Introduction to MS Power Point** - Power point basics - Editing text - Adding subordinate points -Deleting slides - Working in outline view - Using design templates - Adding graphs – Adding organization Charts - Running an electronic slide show - Adding special effects - Creating Presentation using MS power point	
UNIT- IV	**E-Commerce Concepts**: Meaning, Definition, Concepts, Features, Function of E-commerce, E-commerce practices v/s traditional practices, scope & Basic models of E-commerce, Limitations of E-commerce, Precaution for secure E-commerce. Types of E-commerce: Meaning of Business to Customers (B2C), Business to Business (B2B), Consumer to Consumer (C2C), Peer to Peer (P2P), A brief overview on: E-Marketing, E-Payments & E-Finance. **Introduction to Information and Communication Technology**: Definition, ICT in Hospitality sector: Accommodation establishment, types and ICT utilization, strategic and tactical role of ICTs for Hotels, Issues for future of E-hospitality	**CO4**

REFERENCE:

- Leon Alexis and Mathews Leon: lntroduction to Computers, Vikas Publishing House Pvt Ltd. New Delhi
- Bhatnagar S C andRamani K V: Computers and information management. A Primer for Practicing Managers, New Delhi, Prentice Hall of India Pvt. Ltd.
- Bansundara, S: Computer Today.
- Goel Ritender and D N Kakkar: Computer Application in Management, New Age International Publishers, New Delhi.
- Ragaraman, V: Fundamental of Computers, PHI, New Delhi.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE SEC-MHMCT-1

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	3	3	2	3	3	3	1
Co 2	2	3	3	2	3	3	3	1
Co 3	2	3	3	2	3	3	3	1
Co 4	2	3	3	2	3	3	3	1
	2	3	3	2	3	3	3	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE SEC-MHMCT-1

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	2	2	2	1
Co 2	2	2	2	2	1
Co 3	2	2	2	2	1
Co 4	2	2	2	2	1
	2	2	2	2	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE SEC-MHMCT-1

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	2	3	3	3	1	2	2	2	2	1
Co 2	2	3	3	2	3	3	3	1	2	2	2	2	1
Co 3	2	3	3	2	3	3	3	1	2	2	2	2	1
Co 4	2	3	3	2	3	3	3	1	2	2	2	2	1
	2	3	3	2	3	3	3	1	2	2	2	2	1

SEC-MHMCT-2 HOTEL FRENCH -I

Credits –02
External Marks -32
Internal Marks -08
TotalMarks-40

COURSE OBJECTIVES:

CO 1 Identify & use small French expression, vocabulary, articles indefinite & definite, auxiliary 1st group verbs

CO 2 Reading & Reciting various Expressions/vocabulary used for seasons, colors & telling the time; Counting (51-100); Translation; Comprehension based on simple text basic French introduction, fruits, vegetables & 1st group French verbs.

CO 3 Describing & role playing various French conversation.

Co 4 familiarizing for with tourism & hospitality related situations & grammar.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 8 marks (4 short-answer type questions of 2 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 6 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

Unit I	Unit 1 (French Basics-I) Vocabulary & written expression: Expressions used for introduction, greetings, salutations; Days of the week; Month of the year; counting (1-50); translation (simple) Grammar: Definite article; Indefinite article; Subjective pronouns; Conjugation of auxiliary verbs & first group verbs (-er group in positive form in present tense) Oral/Situation: Presentez-vous: (in conversation) Civilization: Name of various countries and their nationality in French.	**CO1**
Unit II	Unit-II (French Basics-II) Vocabulary & written expression: Expressions/vocabulary used for seasons, colours & telling the time; Counting (51-100); Translation; Comprehension based on simple text Grammar: Pronouns: Conjugation of first group verbs in negative & interrogative Adjectives. Oral/Situation: to be given by concern teacher	**CO2**

	Civilization: Name & description of Indian festivals & their importance-(2); Important Indian dishes, their preparation & ingredients-(2)	
Unit III	Unit-III (Book: Bon Voyage , Unit-I: Embarquement Situaion 1: Bienvenue; Situation2: vous parlez francais; Situation3; Quel est votre nom(Includes grammar exercise associated with it)	**CO3**
Unit IV	Unit-IV (Book: Bon Voyage , Unit-I: Embarquement (conti.) Situation 4: une table pour deux personnes; Situation 5: isabelle quelle surprise (Incudes grammar exercises associated with it)	**CO4**

REFERENCE:

- Vasanti Gupta, Malini Gupta, Usha Ramchandran, Bon Voyage, W. R. goyal Publishes and Distributions, New Delhi.
- Odilechantellauvechiari, Sophie, C and Chantal, D., Les Metiers de Tourism, Hachette, Paris.
- French for hotels, frank brothers, New Delhi

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE SEC-MHMCT-2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	3	3	3	1	2	3	3	2
CO3	2	2	3	2	2	2	3	2
CO4	3	3	3	2	3	3	3	2
	2.5	2.75	3	2	2.5	2.75	3	2

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE SEC-MHMCT-2

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	2.75	3	3	3	3

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE SEC-MHMCT-2

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO 4	PSO 5
CO 1	2	3	3	3	3	3	3	2	2	3	3	3	3
CO 2	3	3	3	1	2	3	3	2	3	3	3	3	3
CO 3	2	2	3	2	2	2	3	2	3	3	3	3	3
CO 4	3	3	3	2	3	3	3	2	3	3	3	3	3
	2.5	2.75	3	2	2.5	2.75	3	2	2.75	3	3	3	3

AECC-MHMCT-1-COMMUNICATION SKILLS IN HOTELS

Credits –02
External Marks -32
Internal Marks -08
TotalMarks-40

COURSE OBJECTIVES:

Co 1 : Knowledge of business communication in Hotels
Co 2 : Developing business communication writing skills
Co 3 : Ability to speak verbal communication.
Co 4 : Develop cross cultural communication .

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration)

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 8 marks (4 short-answer type questions of 2 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 6 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

Unit I	Communication theory: Meaning, Significance & Scope of Communication: Models of Communication Process; Filtering in Communication; Words & Meanings, Perception & Reality, Barriers of Communication. Flow of information in business organizations & role of effective commutation in improving it.	**CO1**
Unit II	Business Writing Principles for Clear Business Writing; Adoption, Word Selection, Sentence Construction. Qualities of Business Correspondence, Letters. Important Business correspondence; Letters. Important Business correspondence; Memos, Reports, Inquires and Responses, Persuasive Requests, Sales Letters, Facsimile, Curriculum Vitae, Email, Use of MS Office in Business Communication. Business Report Writing – Organization and Makeup of Different Types of Reports. Techniques of Writing Visual aspects of Reports; layout options & Illustrations.	**CO2**
Unit III	Verbal communication: Oral Business Communication: Dictation, Telephone conversation, Public speaking & oral reporting, Interviews, demonstration, Meeting-Process & Organization of Meetings, Group Discussions. Nonverbal Communication: Body Language, Importance of Gestures in Communication. Reading Body Language in Business Communication.	**CO3**
Unit IV	Cross- Cultural Communication –Concepts of Cultures, Function of Culture,	**CO4**

	Impact of Culture on Communication, Important expressions in Cross Cultural Communication.	

REFERENCE:

- Snell shelagh & Carpenter Jeff, "Communication in Travel & Tourism" Hodder& Stoughton Itd. Kent by Page Bros. (Norwich) Ltd. 1990.
- Leisikar V Raymond & Petit d. John. "Business Communication" Richard D Irwin, 1992.
- Allan Peas, Body Language.
- Desmand Morris, People Watching.
- RK Maddhukar, Business Communication, Vikas Publishing House, New Delhi.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE AECC-MHMCT-1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	3	3	3	1	2	3	3	2
CO3	2	2	3	2	2	2	3	2
CO4	3	3	3	2	3	3	3	2
	2.5	2.75	3	2	2.5	2.75	3	2

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE AECC-MHMCT-1

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	2.75	3	3	3	3

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE AECC-MHMCT-1

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO 4	PSO 5
CO 1	2	3	3	3	3	3	3	2	2	3	3	3	3
CO 2	3	3	3	1	2	3	3	2	3	3	3	3	3
CO 3	2	2	3	2	2	2	3	2	3	3	3	3	3
CO 4	3	3	3	2	3	3	3	2	3	3	3	3	3
	2.5	2.75	3	2	2.5	2.75	3	2	2.75	3	3	3	3

SEMESTER II

CC-MHMCT-3 A FOOD PRODUCTION (THEORY)

Credits –04

External Marks -64
Internal Marks -16
TotalMarks-80

COURSE OBJECTIVES:

Co 1: Learning the functioning of kitchen and familiarize with culinary terms
Co 2: Knowledge and identify various commodities and their use in cooking
Co 3: learn and practice of vegetables cuts, sauces and stocks used in cooking
Co 4: familiar with standard recipes of soups, salads

APPROACHES:
Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.
REQUIREMENTS:
Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.
EVALUATION:
The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration)
MODE OF PAPER SETTING:
There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 12 marks. The question No. 1 shall be covering all the four Units of the syllabus.
These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions

UNIT-I	**INTRODUCTION TO COOKERY:** Levels of skills and experiences, Attitudes and behavior in the kitchen, Personal hygiene, Uniforms & protective clothing, Safety procedure in handling equipment **CULINARY HISTORY:** Origin of modern cookery Classical and New World Cuisine, Different styles cookery: oriental, European, Continental, Pan American **HIERARCHY AREA OF DEPARTMENT AND KITCHEN:** Classical Brigade, Modern staffing in various category hotels, Roles of executive chef, Duties and responsibilities of various chefs, Co-operation with other departments General Layout Of the kitchen in organisations, layout of receiving areas, layout of service & wash up **CULINARY TERMS:** List of culinary (common and basic) terms, Explanation with examples **AIMS & OBJECTIVES OF COOKING FOOD:** Aims and objectives of cooking food, Various textures, Various consistencies, Techniques used in pre-preparation, Techniques used in preparation	**CO 1**
UNIT-II	**COMMODITIES:** **SHORTENINGS** (Fats & Oils): Role of Shortenings,	**CO 2**

	Varieties of Shortenings, Advantages and Disadvantages of using various Shortenings, Fats & Oil – Types, varieties **RAISING AGENTS:** Classification of Raising Agents, Role of Raising Agents, Actions and Reactions **THICKENING AGENTS:** Classification of thickening agents, Role of Thickening agents **HERBS & SPICES** : Uses its Importance & it's different types **BASIC COMMODITIES**: Milk-Introduction, Processing of Milk, Pasteurisation – Homogenisation, Types of Milk – Skimmed and Condensed, Nutritive Value, Cream-Introduction, Processing of Cream, Types of Cream Cheese-Introduction, Processing of Cheese, Types of Cheese, Classification of Cheese, Curing of Cheese, Uses of Cheese Butter-Introduction, Processing of Butter, Types of Butter. Sugar: Its Importance, types of sugar, cooking Of Sugar- Various Temperature	
UNIT-III	**BASIC PRINCIPLES OF FOOD PRODUCTION** **VEGETABLE AND FRUIT COOKERY:** Introduction – classification of vegetables, Pigments and colour changes, Effects of heat on vegetables, Cuts of vegetables, Classification of fruits, Uses of fruit in cookery. **STOCKS:** Definition of stock, Types of stock, Preparation of stock, Recipes, Storage of stocks, Uses of stocks, Care and precautions **SAUCES:** Classification of sauces, Recipes for mother sauces, Storage & precautions	**CO 3**
UNIT-IV	**SOUPS:** Classification with examples, Basic recipes of Consommé with 10 Garnishes and other soups. **SALADS AND SANDWICHES**: Salads & its compositions Types Of Lettuce , Types of Dressing, Emerging trends in salad making, Sandwiches History origin and its Different types **EGG COOKERY**: Introduction to egg cookery, Structure of an egg, Selection of egg, Uses of egg in cookery	**CO 4**

TEXT BOOKS:

- Theory of Catering By Kinton &Cessarani
- Parvinder S Bali – International Cuisine & Food Production – Oxford University Press
- Theory of Cookery By K Arora, Publisher: Frank Brothers

REFERENCE BOOKS:

- Accompaniments & Garnishes from waiter, Communicate: Fuller J. Barrie & Jenkins
- Modern Cookery (Vol-I) By Philip E. Thangam, Publisher: Orient Longman
- Practical Cookery By Kinton&Cessarani
- The Professional Chef (4th Edition) By Le RolA.Polsom
- The Professional Pastry Chef, Fourth Edition By Bo Friberg Publisher: Wiley & Sons INC
- Practical Professional Cookery By Kauffman &Cracknell

	CC-MHMCT-3 B FOOD PRODUCTION (PRACTICAL)

	Credits –02 **External Marks -32** **Internal Marks -08** **Total Marks-40**
1	i) Equipments - Identification, Description, Uses & handling ii) Hygiene - Kitchen etiquettes, Practices & knife handling iii) Safety and security in kitchen
2	i) Vegetables – classification ii) Cuts - julienne, jardinière, macedoines, brunoise, payssane, mignonettes, dices, cubes, shred, mirepoix iii) Preparation of salad dressings
3	Identification and Selection of Ingredients - Qualitative and quantitative measures.
4	i) Basic Cooking methods and pre-preparations ii) Blanching of Tomatoes and Capsicum iii) Preparation of concasse iv) Boiling (potatoes, Beans, Cauliflower, etc) v) Frying - (deep frying, shallow frying, sautéing) Aubergines, Potatoes, etc. vi) Braising - Onions, Leeks, Cabbage vii) Starch cooking (Rice, Pasta, Potatoes)
5	i) Stocks - Types of stocks (White and Brown stock) ii) Emergency stock iii) Fungi stock
6	Sauces - Basic mother sauces • Béchamel • Espagnole • Veloute • Hollandaise • Mayonnaise • Tomato
7	Egg cookery - Preparation of variety of egg dishes • Boiled (Soft & Hard) • Fried (Sunny side up, Single fried, Bull's Eye, Double fried) • Poaches • Scrambled • Omelette (Plain, Stuffed, Spanish) • En cocotte (eggs Benedict)
8	Simple Salads: • Cole slaw, • Potato salad, • Beet root salad, • Green salad, • Fruit salad, • Consommé Simple Egg preparations: • Scotch egg, • Assorted omelletes, • Oeuf Florentine • Oeuf Benedict

	• Oeuf Farci • Oeuf Portugese • Oeuf Deur Mayonnaise Soups Preparations: • Cream Soups • Puree Soups • Consomme Simple potato preparations • Baked potatoes • Mashed potatoes • French fries • Roasted potatoes • Boiled potatoes • Lyonnaise potatoes • Allumettes Vegetable preparations • Boiled vegetables • Glazed vegetables • Fried vegetables • Stewed vegetables. Sandwiches • Open • Club • Closed • Canapé • Zukuskis • Pin wheel • Checkers board
	Preparation of menu **Salads & soups**- Waldrof salad, Fruit salad, Russian salad, salade nicoise, **Soups prepration:** Chowder, Bisque, Veloute, Broth International soups **Indian cookery**- Rice dishes, Breads, Main course, Basic Vegetables, Paneer Preparations Marinades, Paste and Tandoori Preparation of Vegetables and Paneer

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	1	1	2	3	1
Co 2	2	2	2	1	1	2	3	1
Co 3	2	2	2	1	1	2	3	1
Co 4	2	2	2	1	1	2	3	1
	2	2	2	1	1	2	3	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	1	2	1
Co 2	3	3	1	3	1
Co 3	3	3	1	3	1
Co 4	3	3	1	3	1
	3	3	1	2.75	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	1	1	2	3	1	3	3	1	2	1
Co 2	2	2	2	1	1	2	3	1	3	3	1	3	1
Co 3	2	2	2	1	1	2	3	1	3	3	1	3	1
Co 4	2	2	2	1	1	2	3	1	3	3	1	3	1
	2	2	2	1	1	2	3	1	3	3	1	2.75	1

CC-MHMCT-4 A FOOD AND BEVERAGE SERVICE (THEORY)

Credits – 04
External Marks - 64
Internal Marks - 16
Total marks – 80

COURSE OBJECTIVES: Co 1 Gain the Knowledge on catering industry and understand organizational structure of Food & beverage service department in Hotels. Co 2 Familiar with Food &Service areas and back up areas Co 3 Learn about different types of food & beverage equipments & meals. Co 4 Remember the importance of menu planning & various food service methods.		
APPROACHES: Lectures, Group Discussions, Presentations, Practical, case studies, Business Games. **REQUIREMENTS**: Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc. **EVALUATION:** The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration) **MODE OF PAPER SETTING:** There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 12 marks. The question No. 1 shall be covering all the four Units of the syllabus. These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions		
UNIT- I	Introduction to Catering Industry: Introduction and Growth of Catering industry in India Types of Catering Establishments – Commercial (Non Residential/ Residential) Welfare (Industrial Institutional), Transport (Air Road, Rail, Sea), General overview of different types of F & B outlets. Departmental Organization & Staffing; Organizational Structure of F& B Department in small, medium and large hotel, Duties and Responsibilities of & B Staff and their Attributes; Inter Department relations of F and B department.	**CO 1**
UNIT- II	Food Service Area and their Layout: Food Service Areas: Specialty restaurant, coffee shop. Cafeteria, Fast Food Service. Room service Banquets, Bars, Vending Machine. Layout of Food Service Areas: various Considerations while planning a layout of coffee shop, fast food, full-service restaurant, specialty restaurant, Banquets, Room Service, Vending Machines. Back areas: Still Room, Wash-up, Hot-Plate, Plate Room, Kitchen Stewarding, Kitchen Stores.	**CO 2**

UNIT-III	Introduction of Restaurant Equipment and introduction to different Meals Restaurant Equipment's Classification of equipment; Criteria for selection of various types of Crockery, Tableware, Glassware, Linen, Furniture etc.; Sideboard- its uses. Care & Maintenance of these equipment's. Meals and Menu: Planning Concept of Menu and Meal Types of Meals: Breakfast, Lunch, Dinner, Supper, Brunch, High tea etc.	**CO 3**
UNIT-IV	Menu planning & forms of Service Menu: Origin of menu & menu planning objectives, types of menu (table d'hôte, A la Carte, Carte jour), menu planning-consideration & constraints, menu designing, courses, of menu – French: classical and modified, Indian courses: Planning menus, Accompaniments, Garnishing & Cover for each course. Breakfast Menu: English, American, Continental, Indian Restaurant Service: Forms and Methods of service -Table Service – Silver/English, Family, American, Butler/ French, Russian; Self Service - Buffet and Cafeteria Service; Specialized Service – Gueridon, Tray, Trolley, Lounge, Room etc.; Single Point Service-Takeaway, Vending, Kiosks, Food Courts, Bars.; Room Service	**CO4**

REFERENCE:

• S.N Bagchi and Anita Sharma, Food And Beverage Service. Aman Publication, New Delhi.
• Sudhir Andrew, Food And Beverage Manual, Tata Mc. Hills. New Delhi.
• Brain Vergese, Profdssional Food And Beverage Service Management, Macmillan Pub. New Delhi.
• Vijay Dhawan, Food AndVeverage Service. Frank Brothers And Company, New Delhi.

CC-MHMCT-4 B FOOD & BEVERAGE SERVICE (PRACTICAL)

Credits – 02
External Marks - 32
Internal Marks - 08
Total marks – 40

- Opening and Inspecting, Cleaning a Restaurant: Routine cleaning and Non Routine Cleaning.
- Identification of Restaurant Equipments with Diagrams.
- Mis – en Scene, Mis- en – Place.
- Table laying – simple covers: A I' carte & Table d'hote
- Napkin folding, spreading & changing tablecloth.
- Laying table for Iunch /dinner: procedure for laying the table A I carte & Table d'hote and for breakfast.
- Arranging of side Board /Dummy Water.
- Wiping of Glassware, Cutlery and Crockery.
- Special Equipments used in Restaurants.
- Polishing Silver, Silver method , burnishing method

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	3	3	3	2	2	3	3	2
Co 2	3	3	3	2	2	3	3	2
Co 3	3	3	3	2	2	3	3	2
Co 4	3	3	3	2	2	3	3	2
	3	3	3	2	2	3	3	2

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	2	2	3	3	2	3	3	3	3	3
Co 2	3	3	3	2	2	3	3	2	3	3	3	3	3
Co 3	3	3	3	2	2	3	3	2	3	3	3	3	3
Co 4	3	3	3	2	2	3	3	2	3	3	3	3	3
	3	3	3	2	2	3	3	2	3	3	3	3	3

SEC-MHMCT-5 HOTEL LAW

Credits –06
External Marks -20
Internal Marks -80
TotalMarks-100

COURSE OBJECTIVES:

Co 1: Knowledge of Commercial Law and Business Contracts to do Hotel Business.
Co 2: Learning various Hotel Licences and Regulations mandatory for Hotel Business.
Co 3: Familiarize with Indian Food Legislation applicable for all catering Businesses
Co 4: Knowledge of Liquor Licensing.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	Commercial Law & Business Contracts • Memorandum of Association, Articles of Association, • Commencement of Business- Sole Proprietorship, Partnership, Limited Liability Partnerships, Private Limited Companies, Public Limited Companies, Joint Venture Company, Foreign Exchange Management Act-1999, and Foreign Direct Investment Regulatory Issues related with Taxes. • Introduction: Indian Contract Act, 1872 • Understanding Essential Elements of a Contract, Void, Voidable and unenforceable Contracts, Types of Contract • Negotiable Instruments Act, 1881 • Breach of Contracts • Hospitality Contracts: Function Prospectus- Banquets, Purchase Contract, Franchisee Agreement, Management Contract, Technical Services Agreement	**CO 1**
UNIT-II	Hotel Licences And Regulations	**CO 2**

	• General Hotel Operating Licence • Important Licences for Food & Beverage Operations • Mandatory registrations and certifications for Personnel Department and Accounts Department	
UNIT-III	Food Legislation Introduction to Food Adulteration The Prevention of Food Adulteration Act, 1954 Important Legal Term in Food Adulteration Act Food Safety and Standard Act, 2006 Recommended Food Safety Management Plan for Hotels	**CO 3**
UNIT-IV	Liquor Licensing Introduction: Non-Alcoholic Beverages and Alcoholic Beverages Liquor Legislation in India: Prohibition, Dry Days, Legal Age for Drinking Liquor Licensing Procedure Mandatory Compliances of a Liquor Licence Service of Alcohol Beverages Behavioural Traits of an Intoxicated Person Sale of Cigarettes and Tobacco	**CO 4**

SUGGESTED READINGS:

- Hotel Law by Amitabh Devendra , Oxford University Press
- Hotel & Tourism Laws by JagmohanNegi
- Related Guidelines & Reports from Ministry of Tourism, Govt of India
- HOSPITALITY LAW: Managing Legal Issues in the Hospitality Industry by Barth, S
- Food & Beverage Law: Food Safety and Hygiene by Negi, J

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	1	2	1	1	3	3	1
Co 2	2	1	2	1	1	3	3	1
Co 3	2	1	2	3	1	3	3	3
Co 4	2	1	2	1	1	3	3	1
	2	1	2	1.5	1	3	3	1.5

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	1	1	2	1	1
Co 2	1	1	2	1	1
Co 3	1	1	2	1	3
Co 4	1	1	2	1	1
	1	1	2	1	1.5

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	1	2	1	1	3	3	1	1	1	2	1	1
Co 2	2	1	2	1	1	3	3	1	1	1	2	1	1
Co 3	2	1	2	3	1	3	3	3	1	1	2	1	3
Co 4	2	1	2	1	1	3	3	1	1	1	2	1	1
	2	1	2	1.5	1	3	3	1.5	1	1	2	1	1.5

DSE-MHMCT- 6 BASICS OF EVENT MANAGEMENT

Credits –04
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

Co 1 Define the concept, its advantages & disadvantages & types of events.
Co 2 Explain key elements of pre-events planning.
Co 3 Point out event marketing & HR Requirement.
Co 4 Create knowledge about various issues of events such as event catering, event entertainment, financial & crowed management for events.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Introduction to event: The Concept, Nature, Definition and scope, C's of Events, advantage and disadvantage of Events, Various Categories and Typologies, Organization structure of event management companies, Emerging trends in event industry.	**CO 1**
UNIT- II	Organizing & Designing of Events, Event planning – Concept, Process and Design, Pre- Event Research, Studying Event feasibility, legal compliances, Event Venue Finding Logistics and Ambience	**CO 2**
UNIT-III	Event Marketing & Human Resource for event Marketing & Promotion of Events: Nature of Event Marketing, Process of Event Marketing, The Marketing	**CO 3**

	Mix, Sponsorship. Promotion: Image/ Branding, Advertising, Publicity and Public Relation. The Human Research Planning Process: Need Assessment; Policies and Procedures: Job Description; Recruitment and selection; training and development of event staff: Developing Leadership and Supervision skills during Events, Group development, Skills required to be a good event planner	
UNIT- IV	Important Issues in Event planning Event Catering, Events Decorations, Entertainment planning for events and Speaker selection, Various Protocols during Events, Time Management Events, Financial Management of Events. Safety and Security: Occupational Safety and Health, Incident Reporting, Crowd Management and Evacuation. Note: An Event such as Conference/ Seminar/ Theme event may be planned and organized to supplement learning of students.	**CO4**

Suggested Readings:

1. A.K. Bhatia, 'Event Management', Sterling Publishers Pvt. Ltd. Delhi.
2. Anton Shone & Bryn Parry, 'Successful Event Management, Coleman, Lee & Frankle, Powerhouse Conferences. Educational Institute of AHMA
3. Hoyle, Dorf & Jones, Meaning conventions & Group business. Educational institute of AH & MA.
4. Joe Jeff Goldblatt, "Special Events: Best Practices in Modern Event Management (Hospitality, Travel & Tourism)", John Willy and Sons, New York
5. Leonard H. Hoyle, Jr, 'Event Marketing', John Willy and Sons, New York
6. Lynn Van Der Wagen, Carlos, Event Management, Pearson, New Delhi.
7. Sanjay Singh Gaur, Sanjay V Saggere, Event Marketing Management, Vikas Publication, New Delhi
8. John Beech, Sebastian Kaiser, Robert Kaspar - The Business of Events Management Pearson Publications

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
	2.5	3	3	3	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	2.5	3	3	3	3	3	3	2	3	3	3	3	3

DSE-MHMCT-7 SERVICE MARKETING

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

Co 1: Identify unique marketing challenges due to the nature of the tourism and learning hospitality marketing system.
Co 2: Analyze the relationship between market and consumer behaviour for segmentation and target marketing
Co 3: Learn 4 P's of Marketing Mix for Hospitality Product
Co 4: Develop the understanding of expanded service marketing Mix Strategies

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**Marketing of Services** Introduction – Growth of the Service Sector, The Concept of Service, and Characteristics of Services in reference with Hospitality Industry. Challenges to hospitality and tourism marketing. Marketing Concepts (Need, Want, Demand, TQM, Product, Customer value, Customer satisfaction, Exchange &Transaction, Market), Difference between marketing and Selling, Marketing Orientation (Product concept, Production concept, Selling concept, Marketing concept, Societal marketing concept). Hospitality Marketing System: Internal environment, External	**CO 1**

	Environment (Micro environment, Macro environment) Introduction to the Concept of Marketing Mix.	
UNIT-II	**Relationship between Market and Consumer** Consumer Behaviour, Three stage model of service consumption: Pre Purchase Stage- factors influencing Decision Making. Purchase- factors influencing Purchase Post encounter Stage Factors influencing Buying Process Positioning services in competitive market: Introduction Consumer- Driven Services Marketing Strategy Segmenting Service Market Targeting Service Market Principles of Positioning Developing an effective positional Strategy	**CO 2**
UNIT-III	**4 P's of Service Marketing** **Product**: Concept of Hospitality Product, Package as a Product, New, Managing Product, New Product Development, Product Life Cycle, Brand and Branding, hospitality product marketing strategies **Place**: Concept of Hospitality Distribution, Distribution Channels, Management of Channels **Price:** Concept of price & pricing, factors affecting hospitality pricing, methods of pricing, pricing Strategies, Price Fixation in Hospitality. Promotion: Concept of Promotion &Promotion Mix, Developing Promotion for Hospitality Product, Advertising, Personnel Selling, Sales Promotion, Public Relation, Important Promotion tools in Hospitality.	**CO 3**
UNIT-IV	**Expanded Service Marketing Mix** **People:** Service Encounters, People in Tourism service encounters- Consumers, Employees, Residents, Important practices of managing people and service encounters in hospitality- CRM and its Techniques, Internal Marketing and Capacity Building. **Process:** Procedures, Mechanisms, Time & cost Management, Balancing Capacity and demand management of hospitality services using process. **Physical evidence**: Concept & function of physical evidence, service capes and servuction frameworks, components of physical	**CO 4**

	evidence, and managing evidence in hospitality industry.	

Text Books:

1. Chaudhary, M. (2010). Tourism Marketing (1st ed.). New Delhi, India: Oxford University Press.

Recommended Books / Suggested Readings:

1. Philip, K., John, T. & James M,(2016). Marketing for hospitality and tourism (6TH ed.). New Delhi, India: Pearson India education.
2. Prasana, K. (2016). Marketing of hospitality and tourism services (2nd ed). New Delhi, India: Mc Graw Hill education India.
3. Devashish, D. (2011). Tourism marketing (1st ed). New Delhi, India: Pearson India education service.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	1	3	1	3	2	3	1
Co 2	2	1	3	1	3	2	3	1
Co 3	2	1	3	1	3	2	3	1
Co 4	2	1	3	1	3	2	3	1
	2	1	3	1	3	2	3	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	1	2	1	1
Co 2	3	1	2	1	1
Co 3	3	1	2	2	1
Co 4	3	1	2	2	1
	3	1	2	1.5	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1		1	3	1	3	2	3	1	3	1	2	1	1
Co 2	2	1	3	1	3	2	3	1	3	1	2	1	1
Co 3	2	1	3	2	3	2	3	1	3	1	2	2	1
Co 4	2	1	3	1	3	2	3	1	3	1	2	2	1
	2	1	3	1	3	2	3	1	3	1	2	1.5	1

SEC-MHMCT-3 HOTEL FRENCH -II

Credits –02
External Marks -32
Internal Marks -08
TotalMarks-40

CO 1 Identify & use small French expression, vocabulary, articles indefinite & definite, auxiliary 1st group verbs
CO 2 Read & Recite Expressions/vocabulary used for seasons, colors & telling the time; Counting (51-100); Translation; Comprehension based on simple text basic French introduction, fruits, vegetables & 1st group French verbs.
CO 3 Describe & role play conversation situations related to airport; taxi; hotel & restaurant etc.
Co 4 Describe & role play conversation situations related to customs; telephone exchange & restaurant etc.

APPROACHES:
Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.
REQUIREMENTS:
Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.
EVALUATION:
The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).
MODE OF PAPER SETTING:
There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 8 marks (4 short-answer type questions of 2 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 6 marks. The question No. 1 shall be covering all the four Units of the syllabus.
These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

Unit I	Book: bon Voyage, Unit II: Renseignement Vocabulary & written expression: expressions of time, Hotel facilities vocabulary preparing itinerary Place description Grammar: Prepositions, Imperative tenses: Simple future and recent future, Situation 1 Ce matin on va visiter le Taj, situation 2: Ici il est huit heures,. (Includes grammar exercises associated with it)	**CO1**
Unit II	Book: bon Voyage, Unit II: Renseignement (Conti..) Vocabulary & written expression: Place description, direction, preposition of	**CO2**

	location Grammar: Adjectifs, Situation 3: c'est un petite hotel deux etoiles ,Situations 4: Pardon Monsieur , je cherche le palais ; Situations 5: En premiere classe ca fait. (Includes grammar exercises associated with it)	
Unit III	Book: Bon Voyage, Unit III: conseils Vocabulary & written expression: country description ; taking messages, Grammar: tenses: simple past and Imparfait, Partatrive, Personal Pronoun etc. Situations 1 je te conseille ; situations -2 Qu'est -ce que je peux acheter (Includes grammar exercises associated with it)	**CO3**
Unit IV	Book: Bon Voyage, Unit III: conseil (Conti…) Vocabulary & written expression: vocabulary used for describing recipes (any 05), telling about the hotel and its tariff. Grammar: tenses: simple past, Partatrive Personal Pronoun etc. Situations; 3: C'est du poulet aux champignons; Situations; 4: couchez vous tôt ce soir. (Includes grammar exercises associated with it)	**CO4**

REFERENCE:

- Vasanti Gupta, Malini Gupta, Usha Ramchandran, Bon Voyage, W. R. goyal Publishes and Distributions, New Delhi.
- Odilechantellauvechiari, Sophie, C and Chantal, D., Les Metiers de Tourism, Hachette, Paris.
- French for hotels, frank brothers, New Delhi

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	3	3	3	1	2	3	3	2
CO3	2	2	3	2	2	2	3	2
CO4	3	3	3	2	3	3	3	2
	2.5	2.75	3	2	2.5	2.75	3	2

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	2.75	3	3	3	3

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO 4	PSO 5
CO 1	2	3	3	3	3	3	3	2	2	3	3	3	3
CO 2	3	3	3	1	2	3	3	2	3	3	3	3	3
CO 3	2	2	3	2	2	2	3	2	3	3	3	3	3
CO 4	3	3	3	2	3	3	3	2	3	3	3	3	3
	2.5	2.75	3	2	2.5	2.75	3	2	2.75	3	3	3	3

AECC-MHMCT-2 ENVIRONMENTAL PRACTICES IN HOTELS

Credits –02
External Marks -32
Internal Marks -08
TotalMarks-40

COURSE OBJECTIVES:

- Co 1: Understanding environmental issues and their impact on Hospitality industry.
- Co 2: Identifying practices adopted by hospitality industry towards water and energy management.
- Co 3: Develop sensitivity and high work ethics towards waste management
- Co 4: Evaluating environmental certification for hospitality industry.

APPROACHES:
Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.
REQUIREMENTS:
Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.
EVALUATION:
The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration)
MODE OF PAPER SETTING:
There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 8 marks (4 short-answer type questions of 2 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 6 marks. The question No. 1 shall be covering all the four Units of the syllabus.
These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	• Introduction Environment and Ecology • Environmental Threat: Global warming, Greenhouse gases, Carbon foot print, Climate Change, Acid rain, Disaster: Natural and Man made • Importance and impact of Environment on Hospitality Industry • Sustainable Development in Hospitality	**CO 1**
UNIT-II	**Water & Energy Management** • Sources of water pollution by hotels (Laundry, Kitchen, Cleaning agents, Polishing machines, Sewage)	**CO 2**

	• Importance of water conservation • Control of water consumption (Kitchen, Housekeeping, Guest room, Rest room) • Principles of energy management • Types of energy sources – (Renewable, nonrenewable) • Energy Efficiency & Energy - conservation measures adopted by hotel industry • Alternative energy sources for hospitality industry) • Practices adopted by hotels for water and energy management.	
UNIT-III	Waste Management • Introduction : Waste Management • Types of wastes (dry/wet, organic / inorganic, biodegradable / non bio-degradable) • Sources of solid waste found in hotels (e- waste & paper waste, organic-waste, glass, plastic, metals) • 3R's principle (Reduce, Reuse, Recycle) • Strategies and Practices adopted by hotel for managing waste.	**CO 3**
UNIT-IV	• Environmental protection practices as part of Corporate Social Responsibility in the Hospitality Industry • Environmental Certification for Hotels & Tourism Businesses in India: LEED, TERI, ISO (14,000,14001:2004, 14004:2004), ECO MARK SCHEME IN INDIA • Sustainability, • Ecotel in India– Definition, Scope and Importance	**CO 4**

SUGGESTED READINGS:

1. Environment Management for Hotels: A students Handbook-David Kirk
2. Managing Hotels and Restaurant-Dr. Jag Mohan Negi
3. Managing Environment for Leisure and Recreation-Rich Board Hurst
4. The Human Impact on the Natural Environment, Oxford-Blackwell
5. Hotel Management "Educational and Environment Aspects-Yogendra K. Sharma
6. Best Designed Ecological Hotels-Martin N. Kunz
7. Environment Management in the Hospitality Industry –Kathryn Webster
8. Environment Management for Hotels, Oxford, Butterwort-Heinemann

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	2	1	3	3	3	1	3
Co 2	1	2	1	3	3	3	1	3
Co 3	1	2	1	3	3	3	1	3
Co 4	1	2	1	3	3	3	1	3
	1	2	1	3	3	3	1	3

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	1	2	2	2	3
Co 2	1	2	2	2	3
Co 3	1	2	2	2	3
Co 4	1	2	2	2	3
	1	2	2	2	3

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	1	2	1	3	3	3	1	3	1	2	2	2	3
Co 2	1	2	1	3	3	3	1	3	1	2	2	2	3
Co 3	1	2	1	3	3	3	1	3	1	2	2	2	3
Co 4	1	2	1	3	3	3	1	3	1	2	2	2	3
	1	2	1	3	3	3	1	3	1	2	2	2	3

03 MONTHS VOCATIONAL TRAINING / HOTEL INDUCTION TRAINING

(20th May to 20th August)

SEMESTER III

DSE-MHMCT-8 HRM IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Examining significance of human resource management practices in hotels.
- Co 2: Understanding the manpower planning and career planning of employees.
- Co 3: Examining performance and factors of compensation in hotels.
- Co 4: Evaluating industrial relations and employee's participation and empowerment.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	HRM-Concept, Objectives and functions, Role of HR Practitioners; HR Policies, Recent trends in HRM in Hotel industry. Job Analysis and design-meaning, process and methods; Job description of major position in a star hotel.	**CO 1**
UNIT-II	Methods of Manpower search, HR Planning, Recruitment and Selection-Attracting and Selecting HR for deferent levels. Training in hotel industry-need and importance, Methods of training. Career and Succession Planning in hotel industry.	**CO 2**
UNIT-III	Performance appraisal –meaning needs and importance; techniques of performance appraisal in hotel industry. Compensation: Aims & components. Job Evaluation; Pay for performance; Employee benefits & services.	**CO 3**
UNIT-IV	Industrial Relations: Trade unions, Industrial disputes and	**CO 4**

	settlements, Grievances handing. Disciplinary procedures; Health andsafety measure in hotel industry; Employee Participation & empowerment in hotel industry.	

SUGGESTED TEXT BOOKS

- Aswthppa, Human Resurce Management. TMH. ND
- Cases & Games. Himalaya Publishing House.
- Casio Wayne F. Managing Human Resource. MGH. ND

SUGGESTED REFERENCE BOOKS

- Dressler, Gary Human Resource Management. Pearson ducation Asia, ND
- John, Human Resource Management lrwin/MGH
- Mondy R. W., Noe R.M Premeaux S and Mondy J.B., Human resource Management, PHI.
- Malay, B., Human Resource Management in Hospitality Management, Oxford Publications.
- Ramaswamy E Managing Human Resources Oxford University Prss, ND
- Rao, VSP, Human Resource Management –Text &Cas. s. Exeel Book, ND
- SubbaRao, Essentials of Human Resource Management & industrial relations Text,

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	2	1	2	2	1
Co 2	3	3	2	2	2	2	2	1
Co 3	2	2	2	2	2	2	2	1
Co 4	2	2	2	2	1	2	2	1
	2	2	2	2	1.5	2	2	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	1	2	2	1
Co 2	2	1	2	2	1
Co 3	2	1	2	2	1
Co 4	2	1	2	2	1
	2	1	2	2	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	2	1	2	2	1	2	1	2	2	1
Co 2	3	3	2	2	2	2	2	1	2	1	2	2	1
Co 3	2	2	2	2	2	2	2	1	2	1	2	2	1
Co 4	2	2	2	2	1	2	2	1	2	1	2	2	1
	2	2	2	2	1.5	2	2	1	2	1	2	2	1

DSE-MHMCT-9 ENTREPRENEURSHIP AND INNOVATION IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Tell theoretical foundations of entrepreneurship
Co 2 Show the growth of different Management theories
Co 3 Acquaint students with special challenges of starting new ventures
Co 4 Develop an awareness on small scale industry projects

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Entrepreneur: Meaning, Functions, Types of Entrepreneurs, Intrapreneur, Factors influencing the development of entrepreneurs. Entrepreneurship: concept, meaning, definition, importance, characteristics, Development of Entrepreneurship, Stages in Entrepreneurship Process, Functions, Classification.	**CO 1**
UNIT- II	Theories of Entrepreneurship - Peter Duckers Theory, Innovation Theory by Schumpeter & Imitating Theory of High Achievement by McClelland X-Efficiency Theory by Leibenstein - Theory of Profit by Knight, Theory of Social change by Everett Hagen.	**CO 2**
UNIT-III	Communities promoted entrepreneurship in India, Role of entrepreneurs in economics development of a country, Entrepreneurship & its barriers in India, External Influences on Entrepreneurship Development, Socio-Cultural, Political, Economical,	**CO 3**

	Personnel. Entrepreneurial culture with special reference to Intrapreneurship / Corporate Entrepreneurship. Entrepreneurial Success and Failure: Reasons and Remedies	
UNIT- IV	Small Scale Industry (SSI), Definitions, Characteristics, Need and Rationale: Objectives, Scope, Role of SSI, Advantages of SSI, Different Policy of SSI, Government Supports for SSI during Five-Year Plans, Impact of Liberalization, Privatization, and Globalization, Effect of WTO/GATT	**CO4**

Suggested Readings:

1. Dynamics of Entrepreneurship Development – Vasant Desai.
2. Entrepreneurship: New Venture Creation – David H. Holt
3. Entrepreneurship Development New Venture Creation – Satish Taneja, S.L.Gupta
4. Project management – K. Nagarajan.
5. Entrepreneurship: Strategies and Resources – Marc J. Dollinger
6. The Culture of Entrepreneurship – Brigitte Berger.
7. Innovation and Entrepreneurship – Peter F. Drucker
8. Entrepreneurship – Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd
9. Entrepreneurship as Strategy – G. Dale Meyer, Kurt A. Heppard
10. New Vistas of Entrepreneurship: Challenges & Opportunities – A. Sahay, M.S.Chhikara
11. Entrepreneurship and Small Business Management – Siropolis
12. The Entrepreneurial Connection - Gurmeet Naroola
13. Thought Leaders – Steven Brandt.
14. Corporate Entrepreneurship – Vijay
15. Corporate Entrepreneurship: Entrepreneurial Development Inside Organizations – Michael H.Morris, Donald F.Kuratk
16. Peter F., Drucker, Innovation and Entrepreneurship, 1985, Harper; NY 12. Richard Duncombe,
17. Richard Heeks and Sunil Abraham, (2005) A Handbooks for Entrepreneurs in India, Institute for Development Policy and Management (IDPM), UK

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	2	3	3	3	3
CO2	2	3	3	2	3	3	3	3
CO3	2	3	3	2	3	3	3	3
CO4	2	3	3	2	3	3	3	3
	2	3	3	2	3	3	3	3

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	2	2	2	3
Co 2	3	2	2	2	3
Co 3	3	2	2	2	3
Co 4	3	2	2	2	3
	3	2	2	2	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	2	3	3	3	3	3	2	2	2	3
Co 2	2	3	3	2	3	3	3	3	3	2	2	2	3
Co 3	2	3	3	2	3	3	3	3	3	2	2	2	3
Co 4	2	3	3	2	3	3	3	3	3	2	2	2	3
	2	3	3	2	3	3	3	3	3	2	2	2	3

DSE-MHMCT-10 CUSTOMER RELATIONSHIP MANAGEMENT

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

Co1: Apply the concept of CRM, the benefits delivered by CRM, the contexts in which it is used, the technologies that are deployed and how it can be implemented.

Co2: Understanding customers and customer behaviour.

Co3: Implement various technological tools for data mining and also successful implementation of CRM in the Organizations

Co4: Design customer relationship management strategies by understanding customers' preferences for the long-term sustainability of the Organizations.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**Emerging Concepts in Customer Relationship Management:** Meaning and Definition of CRM, Importance of CRM, Conceptual Framework of Customer Relationship Management; The Value Pyramid, Customer Interaction Cycle, Customer Profiling and Total Customer Experience, Goals of a CRM Strategy and Obstacles, CRM Solutions Map, Discussing People, Processes and Technology, CRM myths	**CO 1**

UNIT-II	**CRM Process and Implementation**: Issues and Strategies; Winning Markets through Effective CRM; CRM as a business strategy, CRM Process, Strategies for Customer Acquisition; Customer Retention, Effective Customer Relation Management through Customer Knowledge Management; Customer Interaction Management, Call Centre management in CRM. Customer Centricity in CRM-Concept of Customer centricity, Customer touch points, Customer Service, Measuring Customer life time value-.	**CO 2**
UNIT-III	**Technological Support in CRM**: Introduction, technological Applications in CRM, types of Technological Applications in CRM, Customer Databases and Information Systems, Database Marketing Strategies, Data Mining for CRM - Some Relevant Issues	**CO 3**
UNIT-IV	**e-CRM – Emerging Trend in CRM:** Introduction, Importance of e-CRM in Service Marketing, Challenges involved in formulating and implementing e-CRM strategies, Changing Patterns of e-CRM Solutions in the Future; e-CRM architecture and its components, Five engines of e-CRM, Evolution of e-customer and e-marketing, e-CRM for personalized services, Relevance of CRM for Hotel Industry	**CO 4**

SUGGESTED TEXT BOOKS

- Jagdish N Sheth, Parvatiyar Atul, G Shainesh, Customer Relationship Management: Emerging Concepts, Tools and Applications, 1st Edition, Tata McGraw Hill, June 2008

SUGGESTED REFERENCE BOOKS

- Judith W .Kincaid , Customer Relationship Management Getting it Right, Pearson Education
- H.Peeru Mohamed , A Sagadevan, Custmer Relationship Management, A Step by Step Approach, Vikas Publishing House
- Customer Centricity –Focus on right customer for strategic advantage, by Peter Fader, Wharton Digital Press, 2012

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	2	2	2	2	1
Co 2	2	2	2	2	2	2	2	1
Co 3	2	2	3	1	2	2	3	1
Co 4	3	3	3	3	3	3	3	1
	2.25	2.25	2.5	2	2.25	2.25	2.5	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	1
Co 2	2	2	2	2	1
Co 3	3	3	3	3	1
Co 4	2	2	2	2	1
	2.5	2.5	2.5	2.5	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	2	2	2	2	1	3	3	3	3	1
Co 2	2	2	2	2	2	2	2	1	2	2	2	2	1
Co 3	2	2	3	1	2	2	3	1	3	3	3	3	1
Co 4	3	3	3	3	3	3	3	1	2	2	2	2	1
	2.25	2.25	2.5	2	2.25	2.25	2.5	1	2.5	2.5	2.5	2.5	1

DSE-MHMCT- 11 FINANCIAL MANAGEMENT IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Understanding financial management in hotels.
- Co 2: Examining current assets and working capital.
- Co 3: Understanding management of fixed assets.
- Co 4: Familiarizing sources of funds.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**Financial Management and Planning:** Financial Management Meaning; Scope and Importance, Financial Planning- Meaning, Process and importance in hotel industry.	**CO 1**
UNIT-II	**Management for Current Assets:** Working Capital Management: Meaning and Characteristics of working capital and factors affecting on working Capital, Case Management: Receivables management and inventory Management and meaning, methods and importance.	**CO 2**
UNIT-III	**Management of Fixed Assets:** Capital Budgeting-Meaning, Importance Analytical Techniques for Investment Analysis: Non-discounted Procedures; Discount Cash Flow Procedures.	**CO 3**
UNIT-IV	**Sources of funds:** Management of Earnings: Meaning, Method and importance. Sources of fund: Short term Financing, Trade Credit, and Unsecured Loans Secured Loans Commercial Paper. Long-term financing: Common Stock preferred Stock, Debentures and Retained Earning.	**CO 4**

SUGGESTED TEXT BOOKS

- Lawrence, P. and Lee, R.: Insight into Management, Oxford University Press, Oxford, 1984.
- Blackwell, B: innovation, Technology and finance, London-1988.
- Carring from. J.C. and Edwards, G.T.: Financial Industrial Development Macmillian,
- London, 1979.

SUGGESTED REFERENCE BOOKS

- Kamien, M; and Schwartz N.; Market Structure and Innovation Cambridge University
- Press Cambridge, 1982.
- Banerjee, P.: Fiscal Policy in India, Gyan publisher, Delhi, 1986.
- Sanford, C.; Economics of Public Finance, pergamon Press, New York, 1984.
- Holfert, A.; Techniques of Financial Analysis, Irwin Homewood, Illinois, 1987.
- Krippendors, Jost: The Holiday Makers, Heinemann Professional Publishers, London, 1987.
- Horne, J.V.: Financial Management and Policy, prentice Hall, New York 2011.
- Vyuptakeshsharan, fundamental of financial management, Pearson, New Delhi, 2010.
- Prasanna Chandra, financial management, TATA, McGraw Hill, New Delhi, 2004
- Pandey, I.M.: Financial Management, 2010.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	1	2	2	1	1
Co 2	2	2	2	1	2	2	1	1
Co 3	2	2	2	1	2	2	1	1
Co 4	2	2	2	1	2	2	1	1
	2	2	2	1	2	2	1	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	2	3	2	1
Co 2	3	2	3	1	1
Co 3	3	2	3	1	1
Co 4	3	2	3	1	1
	3	2	3	1.25	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	1	2	2	1	1	3	2	3	2	1
Co 2	2	2	2	1	2	2	1	1	3	2	3	1	1
Co 3	2	2	2	1	2	2	1	1	3	2	3	1	1
Co 4	2	2	2	1	2	2	1	1	3	2	3	1	1
	2	2	2	1	2	2	1	1	3	2	3	1.25	1

OPTIONAL SPECIALIZATION

ROOM DIVISION

CC-MHMCT-5 A, B, C

CC--MHMCT-5 (A) Advance Accommodation Management

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Classify and demonstrate Laundry operations, pest control and relate the environmental management in hotel operations
- Co 2: Practice the designing elements in interior of rooms and in flower arrangement.
- Co 3: Familiarize with types of windows, lightning, wall and floor finishes.
- Co 4: Knowledge about planning overall housekeeping department and related budgets.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**LAUNDRY OPERATION MANAGEMENT:** Commercial and On-site Laundry, Flow process of Industrial Laundering-OPL, Stages in the Wash Cycle , Laundry Equipment and Machines , Layout of the Laundry , Laundry Agents , Dry Cleaning , Guest Laundry/Valet service , Stain removal Methods for removing different stains form fabric **PEST CONTROL MANAGEMENT**: Devising a pest control programme, Preventive measures, Control measures for different infestations **ENVIRONMENTAL MANAGEMENT IN HOTELS:** Eco friendly products used in hotels, Energy and Water Conservation in Hotels	**CO 1**

UNIT-II	**AN INTRODUCTION TO INTERIOR DESIGN AND DÉCOR:** Objectives of interior decoration, Beauty, Expensiveness, Functionalism, Common terms used in décor, elements and Principles of designs and their application in designing. Theme decorations, Synergizing with the ambience **COLOURS:** Understanding colour, colour harmonies, association of colours, psychological effect of colour and their application in the various areas of the hotel industry. Properties of colour, Contrast Effect of light on colour, Choice of colours, Planning a colour scheme of a room, understanding the colour wheel **FLOWER ARRANGEMENT:** Flower arrangement in Hotels Conditioning of flowers & plant material and its importance , Guidelines on preserving freshness of Principles of design as applied to flower arrangement, Equipment essential for flower arrangement Practice, Use of dried plant material and other accessories, Styles of flower arrangements: All-round arrangements, Front-facing arrangements, Creative freestyle arrangements, arrangement for different occasions, Knowledge of indoor plant & horticulture.	**CO 2**
UNIT-III	**WINDOWS AND WINDOW TREATMENT:** The purpose of a window, Types of windows, The importance of suitable window treatments, Selecting fabrics for curtains (practical and visual), Curtain headings, Calculating fabric requirements, Types of window treatments. **LIGHTING**: Introduction to lighting, Lighting Levels- Lux and Lumen Categories- Ambient, Task, Accent, Exterior and Emergency The importance of a good lighting system Artificial lighting -Tungsten, Fluorescent, Discharge, CFL, Halogen.. Types of light distribution-direct, semi direct, indirect, diffused Methods of lighting- architectural and nonarchitectural Lighting in various areas of the hotels Light fittings Selection of lighting systems and energy check list. **WALL FINISHES**: Wallpaper, Fabric, Laminates Wood panelling, Ceramic Tiles, Glass, Textured **FLOOR FINISHES**: Ceramic, Marble Terrazzo, Granite, Concrete, Wood, Resilient (Vinyl, Asphalt, Rubber, Linoleum) Floor Polishes, Types of carpets & uses, Criteria for selection of	**CO 3**

	carpet, cleaning of carpet.	
UNIT-IV	**PLANNING AND ORGANISING THE HOUSE KEEPING DEPARTMENT:** A. Area inventory list, Frequency schedules , Performance and Productivity standards, Time and Motion study in House Keeping operations, Standard Operating manuals – Job procedures , Calculating staff strengths, establishing team work and leadership in House Keeping , Training in HKD, devising training programmes for HK staff. **BUDGET PLANNING:** Budget and budgetary controls, The budget process, Planning capital budget, Planning operation budget, Operating budget – controlling expenses – income statement, Purchasing systems – methods of buying, Stock records – issuing and control.	**CO 4**

SUGGESTED TEXT BOOKS

- Hotel Housekeeping Operations & Management by Raghubalan, Oxford University Press.
- Hotel House Keeping A Training Mannual by Sudhir Andrews, Tata McGraw Hill• publishing company limited New Delhi.

SUGGESTED REFERENCE BOOKS

- Hotel Hostel and Hospital Housekeeping by Joan C Branson & Margaret Lennox, ELBS with Hodder & Stoughten Ltd.
- House Keeping Management by Matt A. Casado; Wiley Publications
- Management of Hotel & Motel Security (Occupational Safety and Health) by H. Burstein, CRC Publisher.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE (CC- MHM&CT5 (A)

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	1	2	1	3	1	3	3
Co 2	2	1	3	2	2	1	3	1
Co 3	1	1	2	1	1	1	2	1
Co 4	3	3	2	3	2	2	3	1
	1.75	1.5	2.25	1.75	2	1.25	2.75	1.5

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	2
Co 3	3	3	3	3	1
Co 4	3	3	3	2	1
	3	9	9	2.75	1.75

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	1	1	2	1	3	1	3	3	3	3	3	3	3
Co 2	2	1	3	2	2	1	3	1	3	3	3	3	2
Co 3	1	1	2	1	1	1	2	1	3	3	3	3	1
Co 4	3	3	2	3	2	2	3	1	3	3	3	2	1
	1.75	1.5	2.25	1.75	2	1.25	2.75	1.5	3	9	9	2.75	1.75

CC-MHMCT-5 B ADVANCE FRONT OFFICE MANAGEMENT

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Understanding the ways of managing hospitality services in hotels.
- Co 2: Examining budgeting and property management systems used in hotel front office.
- Co 3: Evaluating forecasting and yield management techniques.
- Co 4: Get familiar with concepts of timeshare and exchange companies.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**Managing Hospitality**: Importance of hospitality to the hotel guest and the hotel entrepreneur; Managing the delivery of hospitality; Total quality management (TQM) applications; Developing a service management program. Promoting In-House Sales: Role of the front office in a hotel's marketing program; Planning a point-of-sale front office.	**CO 1**
UNIT-II	**Front Office Budgeting:** Introduction, Essentials of a Budget, Budget Preparation, Classification and Types of Budgets, Benefits of budgeting, Problems associated with budgeting, Budgetary Control, Advantages of Budgetary Control **Property Management Systems**: Physical structure and positioningof the front desk; Selecting a property managementsystem (PMS); Using PMS applications.	**CO 2**
UNIT-III	**Planning & evaluating front office operations:** Forecasting techniques; Forecasting Room availability; Useful forecasting	**CO 3**

	data: % of walking, % of overstaying, % of under stay; Forecast formula. **Yield Management:** Occupancy percentage, Average daily rate, RevPAR; History of yield management; Use of yield management; Components of yield management; Applications of yield management.	
UNIT-IV	**Timeshare & vacation ownership**: Definition and types of timeshare options, Difficulties faced in marketing timeshare business Advantages & disadvantages of timeshare business. **Exchange companies**: Resort Condominium International, Intervals International, How to improve the timeshare / referral/condominium concept in India- Government's role/industry role. Latest trends and practices followed in front office.	**CO 4**

SUGGESTED TEXT BOOKS

- Andrews, S. (2017). Hotel Front Office: A Training Manual. McGraw Hill Education; Third edition.
- Bardi, A. J. (2012). Hotel Front Office Management. Wiley India Pvt Ltd; Fifth edition.
- Bhakta, A. (2011). Professional Hotel Front Office Management. McGraw Hill Education.
- Bhatnagar, S. K. (2011). Front Office Management. Frank Bros.
- Kasavana, L. M. (2000). Managing Front Office Operations. Educational Institute of the American Hotel & Motel Association; 5th edition edition

SUGGESTED REFERENCE BOOKS

- Gonda, M. C. (2015). Handbook of Attire & Grooming. Embassy Books; First edition.
- Kasavana, L. M, Cahil, J. J (1992). Managing Computers in the Hospitality Industry. Educational Institute of the Amer Hotel; 2nd edition
- Smart Family (2018). All Countries, Capitals and Flags of the World!.CreateSpace Independent Publishing Platform.
- Tewari, J. (2016). Hotel Front Office: Operations and Management. Oxford University Press; Second edition.

- Woods, H. R., Ninemeier, J. D., Hayes, D. K. and Austin, M. A (2013). Professional Front Office Management: Pearson New International Edition, Pearson Education Limited; illustrated.
- Yadav, M. K. (2014). Hotel Front Office- Management & Operations. Aman Publications; 2 edition.
- James Socrates. Bardi Hotel Front Office Management, 4 th Edition. Wiley

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	2	2	2	3	1
Co 2	2	2	2	2	2	2	3	1
Co 3	2	2	1	1	1	1	3	1
Co 4	3	2	2	1	1	3	3	1
	2.25	2	1.75	1.5	1.5	2	3	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	1
Co 2	2	2	2	2	1
Co 3	3	2	3	2	1
Co 4	2	2	2	2	1
	2.5	2.25	2.5	2.25	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	2	2	2	3	1	3	3	3	3	1
Co 2	2	2	2	2	2	2	3	1	2	2	2	2	1
Co 3	2	2	1	1	1	1	3	1	3	2	3	2	1
Co 4	3	2	2	1	1	3	3	1	2	2	2	2	1
	2.25	2	1.75	1.5	1.5	2	3	1	2.5	2.25	2.5	2.25	1

CC--MHMCT-**5 C MANAGEMENT OF HOUSEKEEPING IN ALLIED SECTORS**

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Develop a understanding about housekeeping planning in hospitals.
- Co 2: Learning various cleaning methods, pest management and occupational health and safety practices in reference with Hospitals.
- Co 3: Familiarize with housekeeping operations in other allied sectors of hospitality.
- Co 4: Knowledge of new trends and environmental practices in housekeeping area.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**HOUSEKEEPING PLANNING IN HOSPITALS:** Housekeeping and its importance, Principles of Cleaning in a Health Care Environment, The Hospital Environment and Sanitation, Organization of Sanitation Department, Cleaning in healthcare organizations, Risk Categorization of hospital area.	**CO 1**
UNIT-II	**CLEANING IN HOSPITALS** Standard operating procedure for cleaning, cleaning agents and disinfections in hospitals, Equipment's used in cleaning, Storage of cleaning supplies and utility room, Bio medical waste management, Pest control in hospitals, Assessment of cleanliness and quality control, Occupation health and safety.	**CO 2**
UNIT-III	**HOUSEKEEPING IN OTHER SECTORS:** Housekeeping in retail sector, Airports, Airlines and Railways: Importance of housekeeping, Organisation fumigation and pest control, Cleaning	**CO 3**

	methods, equipment's and Industrial cleaning agents.	
UNIT-IV	**CHANGING ROLE OF HOUSEKEEPING:** Trends in Housekeeping Operations, new technology in cleaning solutions, Eco friendly housekeeping operations, Housekeeping in an Ecotel Green Housekeeping: Energy Conservation Measures, Water Conservation Measures. Waste Management Measures, study on the Orchid Mumbai: India's eco-pioneer.	

SUGGESTED TEXT BOOKS

- Hotel Housekeeping Operations & Management by Raghubalan, Oxford University Press.
- Hotel House Keeping A Training Mannual by Sudhir Andrews, Tata McGraw Hill• publishing company limited New Delhi.

SUGGESTED REFERENCE BOOKS

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- House Keeping Management by Matt A. Casado; Wiley Publications
- Management of Hotel & Motel Security (Occupational Safety and Health) by H. Burstein, CRC Publisher.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE (CC MHM&CT5 (C)

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	2	2	2	3	2	3	3
Co 2	1	2	2	3	2	2	3	3
Co 3	1	2	3	2	2	2	3	2
Co 4	1	1	2	3	3	2	2	3
	1	1.75	2.25	2.5	2.5	2	2.75	2.75

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	1	3	3	2
Co 2	3	1	3	3	2
Co 3	3	1	3	3	1
Co 4	3	2	3	3	3
	3	1.25	3	3	2

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	1	2	2	2	3	2	3	3	3	1	3	3	2
Co 2	1	2	2	3	2	2	3	3	3	1	3	3	2
Co 3	1	2	3	2	2	2	3	2	3	1	3	3	1
Co 4	1	1	2	3	3	2	2	3	3	2	3	3	3
	1	1.75	2.25	2.5	2.5	2	2.75	2.75	3	1.25	3	3	2

OPTIONAL SPECIALIZATION

FOOD & BEVERAGE SERVICE MANAGEMENT

CC-MHMCT-5 D, E, F

CC-MHMCT-5 D SPECIALIZED CATERING MANAGEMENT

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Show growth & development of catering establishment
Co 2 Tell various food commodities
Co 3 Outline food nutrients and explain balance diet
Co 4 Plan Kitchen & summarize various factors affecting kitchen design

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Catering-Introduction and growth and development over the years. Catering establishments- types, nature and their characteristics	**CO 1**
UNIT- II	Food commodities- types, uses, food value, selection points and storage. Kitchen fuels- Types, characteristics, advantages and disadvantages.	**CO 2**
UNIT-III	Food nutrients- Introduction, types, sources and effect of cooking. Nutritional deficiency diseases- Introduction, causes and remedies Balanced diet- Concept, importance and requirement for different age groups	**CO 3**
UNIT- IV	Kitchen planning- Concept, importance and factors affecting, kitchen environment kitchen designs- designs-	**CO4**

	Types, advantages and service- meaning, types, importance and methods	

Suggested Readings:

1. Food and Beverage Management- by Bernard Davis.
2. Food and Beverage Management- by jones.
3. Managing Service in Food and Beverage Operations- By Cichy and Wise.
4. Food and Beverage Service- By Lillicrap
5. Food and Beverage Service Training Manual- By .S. Andrews.
6. Modern Restaurant A Manual for students and Practitioners- by Fuller.
7. Theory of catering-by Ronald kinton, Victor Ceserani and David Foskett

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	2	3	3	3	2
CO2	2	3	3	2	3	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	2	3	3	3	2
	2.5	3	3	2	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	2	2
Co 2	3	3	3	2	2
Co 3	3	3	3	2	2
Co 4	3	3	3	2	2
	3	3	3	2	2

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	2	3	3	3	2	3	3	3	2	2
Co 2	2	3	3	2	3	3	3	2	3	3	3	2	2
Co 3	3	3	3	2	3	3	3	2	3	3	3	2	2
Co 4	3	3	3	2	3	3	3	2	3	3	3	2	2
	2.5	3	3	2	3	3	3	2	3	3	3	2	2

CC-MHMCT-5 E F& B CONTROL MANAGEMENT

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Define Cost and sales concept, control process & cycle
Co 2 Summarize controlling of food sales.
Co 3 Demonstrate about beverage control
Co 4 Cite importance of labour cost

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Cost and Sales Concept – Introduction, Cost Concepts, Sales Concepts, Cost to Sales Ratio: Cost Percent Control Process – Introduction, Control, The Control Process, Control Systems, Cost Benefit Ratio Control Cycle – Purchasing, Receiving, Storing, Issuing	**CO 1**

UNIT- II	Menu Engineering & Analysis – Introduction, Menu Engineering, Menu Analysis Controlling Food Sales – Introduction, the goals of sales control, Optimizing the number of customers, Maximising the profit, Controlling Revenue, Revenue Control using manual means, Revenue Control using computers	**CO 2**
UNIT-III	Beverage Control- Beverage, Purchasing-Receiving, Storing – Issuing Control, Beverage Production Control, Inventory turnover, Beverage Sales Control, Guest Checks and Control	**CO 3**
UNIT- IV	Labour Control- Labour Cost Considerations, Establishing Performance Standards, SOP, Standard Staffing Requirements, preparing job descriptions, Training Staff, Monitoring Performance, Taking Corrective action to address discrepancies between standards and performance	**CO4**

Suggested Readings:

REFERENCE:

• S.N Bagchi and Anita Sharma, Food and Beverage Service. Aman Publication, New Delhi.
• Sudhir Andrew, Food and Beverage Manual, Tata Mc. Hills. New Delhi.
• Brain Vergese, Professional Food and Beverage Service Management, Macmillan Pub. New Delhi.
• Vijay Dhawan, Food and beverage Service. Frank Brothers and Company, New Delhi.

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	2	3	3	3	2
CO2	2	3	3	2	3	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	2	3	3	3	2
	2.5	3	3	2	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	2	2
Co 2	3	3	3	2	2
Co 3	3	3	3	2	2
Co 4	3	3	3	2	2
	3	3	3	2	2

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	2	3	3	3	2	3	3	3	2	2
Co 2	2	3	3	2	3	3	3	2	3	3	3	2	2
Co 3	3	3	3	2	3	3	3	2	3	3	3	2	2
Co 4	3	3	3	2	3	3	3	2	3	3	3	2	2
	2.5	3	3	2	3	3	3	2	3	3	3	2	2

CC-MHMCT-5 F BAR OPERATION & MANAGEMENT

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Classify different Beverages & venues offering beverage services
Co 2 Show various fermentation alcoholic beverages & their service
Co 3 Explain variety of sprits & their service
Co 4 Illustrate various F& B control methods, licenses used & their service

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Introduction to Beverages: Alcoholic and Non-alcoholic Beverage: Venus offering beverage service –Bars- types, Lounges, restaurants: Bar designing and layout: important considerations. Staffing and Bar Equipment: staffing in bar, Qualities of a good bartender and it's job description, Beverage equipment's and service knowledge; beverage equipment and glassware, service equipment's used in bar	**CO 1**

UNIT- II	Fermented Alcoholic Beverages: Wine: introduction, Wine's classification, Viticulture and viticulture methods, Vilification process (Still, Sparkling, Aromatized and fortified Wines) Vine diseases, wines regions France, Italy, Spain, Portugal, Africa, Australia, India, and California, food and wine harmony, Wine glasses and equipment, Storage and service of wine. Beer; Introduction ingredients used, production, types, brands, Indian and International. Storage of beer. service of bottled, canned and drought beers. Various snacks served with beer. A brief introduction to Sake, Cider and Perry.	**CO 2**
UNIT-III	Distilled Alcoholic Beverages (sprits): History of sprits: basic introduction to distillation process. Whiskey: Introduction, manufacturing process and classification. Brief introduction to Rum, Gin, Vodka and Brandy.	**CO 3**
UNIT- IV	Beverage control meaning, process and techniques: various liquor licenses required in India. Introduction to Cocktails, Brief history of development: Parts of cocktails. Brief introduction to Mocktails and tobacco.	**CO4**

Suggested Readings:

1. Cotas Katsigris, Mary Porter, Chris Thomas, The Bar and Beverage books, John, Willy and Sons, USA. • Graham Brown, Karon Hepner, The Waiters Handbooks, Hospitality Press, Australia.
2. Russell.S, Frank Corsar, The Bartender's Guide to Cocktails, Hospitality Press, Australia.
3. S.N Bagchi and Anita Sharma, Food and Beverage Service, Aman Publication, New Delhi.
4. Sudhir Andrew, Food and Beverage Manual Tata Mc. Hills. New Delhi
5. Brain Verghese, Professional Food AndVeverage Service Management. Macmillan India, Ltd.
6. Vijay Dhawan, Food and Beverage Service, Frank Brothers and Company, New Delhi.
7. B. Verjpef, The Complete Encyclopaedia of Beer, Rebo Publishers. • David Burrougtd And Norman Bezzant, Wine Regions of The World, Butterworth Heinemann, Oxford U.

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	3	3	2
CO2	3	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
	3	3	3	3	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	3	3	3	3	3	3	3	2	3	3	3	3	3

CC-MHMCT-6 TRAINING REPORT & VIVA VOCE

Credits –12
External Marks -300
Total Marks-300

SEMESTER IV

DSE- MHMCT-12 RESEARCH METHODOLOGY

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: To enable the participants in conducting research work and formulating research synopsis and report.
- Co 2: To familiarize with various research designs and data collection methods.
- Co 3: Develop understanding on sampling techniques.
- Co 4: To impart knowledge for enabling students to develop data analytics skills and meaningful interpretation to the data sets so as to solve the business/Research problem.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**INTRODUCTION**: Definition, Objectives and Nature of Research, Types of research, characteristics of good research, The Research Process; Identification and Definition of Research problem, Review of literature, Hypothesis Formulation; Developing Research Proposal; Ethical issues in Research. Problems encountered by the Researcher	**CO 1**
UNIT-II	**RESEARCH DESIGN AND DATA COLLECTION**: Types of Research Design, Sources of data : Secondary and Primary Data, Primary Data Collection Instruments: Questionnaire method, Observation Methods, Scaling Techniques, and Attitude Measurement, properties of different scales	**CO 2**
UNIT-III	**SAMPLING:** Defining the Universe and Sampling Unit; Sampling Frame; Probability and Non probability, Sampling	**CO 3**

	Methods; Sample Size Determination, Data Collection Methods	
UNIT-IV	DATA ANALYSIS: Interpretation and Report Preparation, graphical presentation of data, descriptive techniques, understanding Normal Distribution, Hypothesis Testing; Analysis of Variance; t-test, Advanced Data Analysis Techniques- Factor Analysis, correlation, linear regression Qualitative Analysis: case method, observation, Delphi Report Preparation and Presentation	**CO 4**

SUGGESTED TEXT BOOKS

- Donald, R. Cooper and Parmela, S. Schindler. Business Research Methods. Tata McGraw Hill.
- Kothari C.R. Research Methodology Methods and Techniques. New Age Publisher

SUGGESTED REFERENCE BOOKS

- Research Methods for Business students by Saunders, (Pearson Education)
- Research Methodology by Panneer Selvam , (Prentice Hall of India)
- Research Method for Behavourial Sciences by Gravetter (Cengage Learning)

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

CC- MHM&CT 5 A

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	3	3	3	3	3	2	2
Co 2	1	1	2	1	1	3	3	1
Co 3	1	1	2	2	2	3	2	1
Co 4	3	3	3	3	3	3	3	3
	1.75	2	2.5	2.25	2.25	3	2.5	1.75

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	2	3	1	1
Co 2	1	1	2	1	1
Co 3	2	1	2	1	1
Co 4	2	1	2	1	3
	2.25	1.25	2.25	1	1.5

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	3	3	3	3	3	2	2	3	2	3	1	1
Co 2	1	1	2	1	1	3	3	1	1	1	2	1	1
Co 3	1	1	2	2	2	3	2	1	2	1	2	1	1
Co 4	3	3	3	3	3	3	3	3	2	1	2	1	3
	1.75	2	2.5	2.25	2.25	3	2.5	1.75	2.25	1.25	2.25	1	1.5

DSE- MHMCT-13 DECISION SCIENCE IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Omit theoretical foundation of Probability theory & explain decision making
Co2 Show quantitative techniques of programming technique in decision making.
Co3 Understand decision theories.
Co 4 Show network analysis

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Probability Meaning. Approaches of Probability Theory, Addition and Multiplication Theorems, Conditional Probability, Bayes Rule, Probability Distributions Binominal Poisson. Normal Distribution. Application of Probability Theory in Hotel Business Decision Making Linear Programming - Meaning. Assumptions of Linear Programming, Formulation of Linear	**CO 1**
UNIT- II	Programming Model. Solution of Linear Programming Problem with the help of Graphical and Simplex Method, Concept of Duality, Shadow Prices Sensitivity Analysis. Role LP in Economic Decision-Making Transportation Problems, Initial Basic Feasible Solution, Test for Optimality Assignment Problems, Travelling Salesman	**CO 2**

	Model	
UNIT-III	Decision Theory-Decision under Certainty, Uncertainty and Risk, Decision Tree Analysis, Game Theory Pure and Mixed Strategies, Principle of Dominance, Solution of Game Theory, Problems with the help of Graphical, Algebraic and Simplex Methods.	**CO 3**
UNIT- IV	Network Analysis Meaning of Networking, Network Analysis with help of PERT and CPM Models Resource Planning and Meaning of crashing, Queuing Theory Meaning, Concepts and assumptions of queuing models, M/M/LIFE Simulation Modelling.	**CO4**

Suggested Readings:

1. Render B. Stair RM. Hanna M.E and Badri T. N. (2016), Quantitative Analysis for Management. 12/e. Pearson Education.
2. Black K. (2016), Business Statistics: For Contemporary Decision Making, 9/e, Wiley-India.

3. Sharma, J.K. (2016). Operations Research: Theory and Applications, 6/e, Macmillan, India 2. Taha. H. (2013), Operations Research: An Introduction, 9le, Pearson Education.
4. Levin R. and Rubin D.S. (2017), Statistics for Management. 8/e. Pearson Education 4. Kapoor V.K. (2014). Operations Research: Techniques for Management, 9/e. Sultan Chand & Sons, New Delhi

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	2	2	2
CO2	2	3	3	3	3	2	2	2
CO3	3	3	3	3	3	2	2	2
CO4	3	3	3	3	3	2	2	2
	2.5	3	3	3	3	2	2	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	2	2	3	3
Co 2	3	2	2	3	3
Co 3	3	2	2	3	3
Co 4	3	2	2	3	3
	3	2	2	3	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	3	3	2	2	2	3	2	2	3	3
Co 2	2	3	3	3	3	2	2	2	3	2	2	3	3
Co 3	3	3	3	3	3	2	2	2	3	2	2	3	3
Co 4	3	3	3	3	3	2	2	2	3	2	2	3	3
	2.5	3	3	3	3	2	2	2	3	2	2	3	3

OPTIONAL SPECIALIZATION

EVENT MANAGEMENT

CC-MHMCT-7 A, B, C

CC-MHMCT-7A EVENT PRODUCTION & LOGISTICS PLANNING

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Outline entertainment & décor related requirement for event
Co 2 Discover audio-visual and lightning system in production
Co 3 Identify special effect, staging & tenting requirement
Co 4 Prepare for various logistics for events.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Entertainment & Decor Defining Entertainment: forms, reasons & content of entertainments; Staging entrainment; Working with performers Décor: Design theory – its elements, principles, categories of Décor; Setup consideration for Décor	**CO 1**
UNIT- II	Audio – Visual & Lightning systems Audio System -Acoustic theory and its relationship to the event space, uses of an audio system, main audio system groups and their components, Signal path & equipment location in the Event Space, Pre event sound check & system operations during event, risk & safety Visual presentation – purpose, visual sources, signal processing,	**CO 2**

	projection equipment's, display equipment's, Multimedia presentation, visual equipment's setup & operations during event, risk & safety Lighting – Objective of event lightning, quality, lightning instruments, Event lightning Design, lightning concept, setup & operations; risk & safety	
UNIT-III	Special Effects, Staging & tenting Special effect – types of special effects Staging – the language of stage, types & construction of stages, placement, stage draping, stage sets, risk & safety Tenting – types, various accessories of tents, setup considerations, new tent technology.	**CO 3**
UNIT- IV	Miscellaneous technical resources and logistics & operations Miscellaneous - Electric power, Rigging and trussing & other temporary structure. Logistics – setup & teardown	**CO4**

Suggested Readings:

1. Doug Matthews (2008), Special Event Production, Elsevier Inc.
2. Lynn V. and Brenda R., Event Management, Pearson Publication, New Delhi
3. Van der Wagen, L. & Carlos, B.R. (2005). Event management for tourism cultural, Business and Sporting Events, Upper Saddle River, N.I. Pearson, Prentice Hall.
4. S.N. Bagchi and Anita Sharma Food and Beverage Service, Aman Publication New Delhi.
5. Lawson, F.R. Congress, Conventions and Conference: facility Supply and demand International Journal of Tourism management, September, 18-8-1980.
6. Goldblatt, JJ Special Events: Art and Science of Celebration New York, Van Nostrand Reinhold, 1990.
7. Torkildsen G Organisation of major events. In G Torkildsen, Leisure and Recreation Management, 4th Eds. London New York E & FN Spon: Routledge 1999,
8. Watt, DC Event Management in Leisure and Tourism Harlow, Essex: Addison Weslex Longman Ltd., 1998.
9. Wilkinson, DG the Event Management and Marketing Institute. Ontario; the Event Management and Marketing Institute. 1998
10. Lawson, F.R., Congress, Conventions and Conference Facility supply and Demand, International Journal of Tourism Management, September, 188,1980.

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
	2.5	3	3	3	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	2.5	3	3	3	3	3	3	2	3	3	3	3	3

CC-MHMCT-7 B MICE EVENTS PLANNING & MANAGEMENT

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Explain basics of MICE
Co 2 Tell marketing & Promotion of MICE
Co 3 Discover planning, organizing & operation of MICE
Co 4 Prepare a Risk Management for MICE

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Introduction to MICE: Evolution of MICE in India, Components of MICE, Economical and Social significance of MICE, Elements of MICE –Lodging, Food & Beverage, Transportation (Different types of transportation modalities), Attractions & Entertainment. Introduction to professional meeting planning: Definition, types and roles-associate, corporate, independent, TA's and TO's, Convention visitor Bureaus functions, structure and funding sources. Meetings, workshops, seminars and conferences; understanding trade fairs and exhibitions; Role of Hotels in MICE, major players of MICE	**CO 1**

UNIT-II	Marketing & Promotion of MICE: Definition of conference, the components of the conference market. The nature of MICE markets and demand for conference facilities, Segmentation, Targeting and Positioning Techniques, Marketing channels, Process of MICE Marketing, The MICE Marketing mix, Sponsorship, Image/Branding, Advertising, Publicity, SWOT Analysis, DMOs and DMCs- their role and support in India.	**CO 2**
UNIT-III	Planning, Organizing, Operations and Logistics: Develop a mission, Creating Meeting objectives, preparing an event proposal, Needs Analysis, Site Selection, Budgetary Concerns-Establish Goals, identify expenses, Identify Revenue sources & Cost control, planning tools, protocols, Dress codes, Staging, Staffing, Pre-and Post Meeting Management, Registration, Onsite Registration, Evaluation, Logistics planning for MICE, Introduction to Conference facilities in India, Role and functions of ICPB and ICCA. Planning MEEC: Linkages with tourism; travel agency and hotel operations for business travelers.	**CO 3**
UNIT-IV	Risk Management for MICE: Types of Risk-Legal Risk, Operational Risk, Financial Risk and HRM Risk, Technology-Related Risk, Safety and security Risk, Process of Risk Management, Incident Reporting, Standards of Risk Management.	**CO4**

Suggested Readings:

1. Fenich, George G, Meetings, Expositions, Events, and Conventions, India: Pearson Education Inc
2. Lynn V. and Brenda R., Event Management, Pearson Publication, New Delhi
3. Van der Wagen, L. & Carlos, B.R. (2005). Event management for tourism cultural, Business and Sporting Events, Upper Saddle River, N.I. Pearson, Prentice Hall.
4. S.N. Bagchi and Anita Sharma Food and Beverage Service, Aman Publication New Delhi.
5. Lawson, F.R. Congress, Conventions and Conference: facility Supply and demand International Journal of Tourism management, September, 18-8-1980.
6. Goldblatt, JJ Special Events: Art and Science of Celebration New York, Van Nostrand Reinhold, 1990.
7. Torkildsen G Organisation of major events. In G Torkildsen, Leisure and Recreation Management, 4th Eds. London New York E & FN Spon: Routledge 1999,
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9. Wilkinson, DG the Event Management and Marketing Institute. Ontario; the Event Management and Marketing Institute. 1998

10. Lawson, F.R., Congress, Conventions and Conference Facility supply and Demand, International Journal of Tourism Management, September, 188,1980.

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
	2.5	3	3	3	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	2.5	3	3	3	3	3	3	2	3	3	3	3	3

CC-MHMCT-7 C SPECIALIZED EVENTS IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Explain Special Events & Design wedding events
Co 2 Understanding various corporate events
Co 3 Prepare thematic events
Co 4 Planning exhibition & trade fairs

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Introduction to Special Events Wedding events – Introduction to Wedding Planning and Special Events, Types of Special Events/Wedding, arranging a Special Event, arranging a Wedding, Budgeting & Planning, Venue, Wedding Themes, Catering, The Wedding Dress, Flowers, Transport, Invitation, Photographer, Weddings Hire and Entertainment. Overview of Indian Weddings Management: understanding India and its weddings system. Destination Wedding.	**CO 1**

UNIT- II	**Corporate Events -** Business meetings, Product Launch, Annual meetings, Non-profit Events, Gala's night, fundraisers event, key elements of conference management, Types of conference, Conference Planning checklist, Session Planning and Timing, Type of Presentation, Role of delegates/audience, Policies related to conference, Promotion of Conference, Documentation and administration related to organization of Conference.	**CO 2**
UNIT-III	**Theme parties**: meaning, types, various considerations while organizing theme parties. Birthday parties - Planning & Management Thematic events: Dessert festival, Cattle fair, food festivals, Mango festival, Craft Fair etc.	**CO 3**
UNIT- IV	Introduction to Exhibitions and Trade Fairs, Scope of exhibition and trade fair, Types of exhibitions and fairs, element of exhibition planning, duties and responsibilities of key trade fair and exhibition personnel, Players of exhibition, Exhibition fees, Shipping methods and Marketing and promotional plan for exhibitions.	**CO4**

Suggested Readings:

1. Doug Matthews (2008), Special Event Production, Elsevier Inc.
2. Lynn V. and Brenda R., Event Management, Pearson Publication, New Delhi
3. Van der Wagen, L. & Carlos, B.R. (2005). Event management for tourism cultural.
4. Business and Sporting Events, Upper Saddle River, N.I. Pearson, Prentice Hall.
5. S.N. Bagchi and Anita Sharma Food and Beverage Service, Aman Publication New Delhi.
6. Lawson, F.R. Congress, Conventions and Conference: facility Supply and demand International Journal of Tourism management, September, 18-8-1980.
7. Goldblatt, JJ Special Events: Art and Science of Celebration New York, Van Nostrand Reinhold, 1990.
8. Torkildsen G Organisation of major events. In G Torkildsen, Leisure and Recreation Management, 4th Eds. London New York E & FN Spon: Routledge 1999,
9. Watt, DC Event Management in Leisure and Tourism Harlow, Essex: Addison Wesley Longman Ltd ., 1998.
10. Wilkinson, DG the Event Management and Marketing Institute. Ontario; the Event Management and Marketing Institute. 1998
11. Lawson, F.R., Congress, Conventions and Conference Facility supply and Demand, international Journal of Tourism Management, September, 188,1980.

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
	2.5	3	3	3	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	2.5	3	3	3	3	3	3	2	3	3	3	3	3

OPTIONAL SPECIALIZATION

HOTEL MARKETING

CC-MHMCT-7 D, E, F

CC--MHMCT-7 D HOTEL MARKETING RESEARCH

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Analyze the roles, the functions, ethics and scope of marketing research
- Co 2: Examine the research Process at planning stage.
- Co 3: construct questionnaire and identify various statistical tools for analysis of data.
- Co 4: Appling research technique at different areas of marketing.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**MARKETING RESEARCH DYNAMICS**- Introduction, Meaning of Research, Research Characteristics, Various Types of Research , Marketing Research and its Management, Nature and Scope of Marketing Research , Marketing Research versus Market Research, Ethics in marketing research, Marketing Research in the 21st Century (Indian Scenario),	**CO 1**
UNIT-II	**PLANNING THE RESEARCH PROCESS:** Introduction, Research Process: An Overview, Formulation of a Problem, Research Methods, Research Design: Introduction, Meaning of Research Design, Types of Research Design, Descriptive Research, Causal Research Design, Research Design and Marketing Decision Process, Choosing a Good Research Design, Data collection Sources and Methods: Introduction, Meaning, Advantages and Drawbacks of primary and secondary data.	**CO 2**
UNIT-	**QUESTIONNAIRE DESIGN, SAMPLING AND ANALYSIS**:	**CO 3**

III	Designing a Questionnaire: Introduction, Questionnaire Design, Sampling Theory-Design, size and Techniques: Introduction, Meaning of Sampling, Importance of Sampling in Marketing Research, Sampling Techniques, Data Analysis: Introduction, Statistics in Data Analysis, Different data analysis techniques : Measures of Central Tendency, Descriptive Statistics, Univariate Analysis, Bivariate Analysis, Correlation analysis, analysis of variance etc., Data Interpretation and Report Writing Writing a Market Research Report, Structure of the Report, Components of a Report, Style and Layout of a Report,	
UNIT-IV	**APPLICATIONS OF MARKETING RESEARCH** : Product Research: Research in new product development, product life cycle research, Sales control Research: Sales Forecasting, Sales Analysis, Advertising Research, Motivational Research.	**CO 4**

SUGGESTED TEXT BOOKS

- Marketing Research Principles, Applications and cases by Dr. D.D. Sharma, Sultan Chand & Sons
- Marketing Research Concepts, Practices, and Cases by Sunanda Easwaran & Sharmila J. Singh, Oxford University Press

SUGGESTED REFERENCE BOOKS

- Marketing Research an Applied Orientation by Naresh K. Malhotra, Prentrice Hall of India Pvt Ltd
- Marketing Research an Applied Orientation by Naresh K. Malhotra & Satyabhushan Dash, Perason Publications
- Marketing Research Kit For Dummies by Michael R. Hyman & Jeremy J. Sierra Published by Wiley Publishing, Inc.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE (CC- MHM&CT5 (A)

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	1	2	3	3	2
Co 2	1	1	2	2	1	3	3	1
Co 3	2	1	2	1	1	3	3	1
Co 4	1	1	1	3	2	3	2	1

	1.5	1.25	1.75	1.75	1.5	3	2.75	1.25

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	2	3	3	3
Co 2	2	2	2	2	2
Co 3	1	1	1	2	1
Co 4	1	1	1	1	1
	1.75	1.5	1.75	2	1.75

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	1	2	3	3	2	3	2	3	3	3
Co 2	1	1	2	2	1	3	3	1	2	2	2	2	2
Co 3	2	1	2	1	1	3	3	1	1	1	1	2	1
Co 4	1	1	1	3	2	3	2	1	1	1	1	1	1
	1.5	1.25	1.75	1.75	1.5	3	2.75	1.25	1.75	1.5	1.75	2	1.75

CC- MHMCT-7 E SALES MANAGEMENT IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Describe the nature and importance of sales management and its process
- Co 2: Identify the skills of a successful sales person and learn the selling process
- Co 3: Analyzing the sales information to forecast the market demand
- Co 4: Learn the strategies to manage the sales team

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**INTRODUCTION TO SALES MANAGEMENT** Introduction, nature, role and importance Personal selling, Types of selling Difference between selling and marketing Sales Management Process Emerging trends in sales management	**CO 1**
UNIT-II	**SELLING SKILLS AND SELLING TECHNIQUES** Selling skills Selling and Buying styles The Selling process Theories of Selling	**CO 2**
UNIT-III	**MANAGING SALES INFORMATION SALES ORGANISATION** Forecasting Market demand	**CO 3**

	Sales Organisation Organisational principles Organisational Design Management of Sales Territory Management of Sales Quota	
UNIT-IV	**SALES FORCE MANAGEMENT** Job Analysis, Recruitment and Selection Training the Sales Force Compensation and Motivation of Sales Force Monitoring and Performance Evaluation Sales Control	**CO 4**

SUGGESTED TEXT BOOKS

- Sales and Distribution Management by Tapan K. Panda & Sunil Sahadev, Oxford University Press
- Sales Management shaping future sales leaders by John F. Tanner JR., Earl D. Honeycutt JR. & Robert C. Erffmeyer, Perason Eduation

SUGGESTED REFERENCE BOOKS

- Anderson, R. Professional Sales Management. Englewood Cliff, New Jersey, Prentice Hall Inc.
- Anderson, R. Professional Personal Selling. Englewood Cliff, New Jersey, Prentice Hall Inc.
- Buskirk, R H and Stanton, W J. Management of Sales Force. Homewood Illonois, Richard D Irwin

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE (CC- MHM&CT5 (A)

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	1	1	1	1	2	1
Co 2	2	3	1	1	2	1	1	1
Co 3	2	2	2	2	2	3	1	1
Co 4	2	3	3	3	3	2	3	1

	2	2.5	1.75	1.75	2	1.75	1.75	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	1	2	2	1
Co 2	2	1	1	1	1
Co 3	2	2	2	1	1
Co 4	3	1	1	1	1
	2.75	1.25	1.5	1.25	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	1	1	1	1	2	1	2	1	2	2	1
Co 2	2	3	1	1	2	1	1	1	2	1	1	1	1
Co 3	2	2	2	2	2	3	1	1	2	2	2	1	1
Co 4	2	3	3	3	3	2	3	1	3	1	1	1	1
	2	2.5	1.75	1.75	2	1.75	1.75	1	2.75	1.25	1.5	1.25	1

CC-MHMCT-7 F DIGITAL AND SOCIAL MEDIA MARKETING

Credits –06
External Marks -80
Internal Marks -20
Total Marks-100

COURSE OBJECTIVES:

Co 1 Explain the importance of digital marketing
Co 2 Learn the key elements of a digital marketing strategy
Co 3 Examine various measurement metrics.
Co 4 Understand various payment gateways

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT- I	Introduction to Digital Marketing (DM) - Overview of Digital marketing; Meaning, Definition, Origin and Need of Digital marketing in Hotel Industry, History of DM, Traditional Vs. Digital Marketing, Concept and approaches to DM, Advantage and Disadvantage. Scope of DM in Hotel Industry, Future of digital marketing in Indian Hotel Industry and outside India. Examples of good practices in DM in Hospitality Industry.	**CO 1**

UNIT-II	Modes of Digital Marketing- Mobile marketing; Overview of the B2B and B2C Mobile Market. Email Marketing- Need for Emails, Types of Emails, and options in Email advertising. Social media marketing and other forms of digital Marketing. Overview of various tools of digital marketing	**CO 2**
UNIT-III	Measurement Metrics- Digital Marketing Media, Budget Allocation, ROI for Digital Marketing, Analytics and Key Performance Indicators (KPI); Attribution Models and Frameworks; Digital Marketing in Governance. Emerging Technologies for Digital Marketing. Leading and Managing Digital Marketing teams	**CO 3**
UNIT-IV	Payment Gateways and Security System- Electronic Payment System; Electronic cash; Smart cards; Risk and Electronic payment system; Types of Transaction security- Security risk of ECommerce; Types and sources of threats; Protecting e-business assets and intellectual property; firewalls; client server network security.	**CO4**

Suggested Readings:

1. Chaffey. D., E-Business and E-Commerce Management: Strategy, Implementation and Practice, Pearson Education India.
2. Kotler, P. Kartajaya, H and Setiawan, I., Marketing 4.0: Moving from Traditional to 12 Digital, Wiley.
3. Tapp, A., & Whitten, I., & Housden, M; Principles of Direct, Database and Digital Marketing, Pearson.
4. Tasner, M; Marketing in the Moment: The Digital Marketing Guide to Generating More Sales and Reaching Your Customers First, Pearson Education.
5. "Basics of Digital Marketing" MOOC on SWAYAM Portal of UGC, https://swayam.gov.in/nd2_cec20_mg15/preview
6. "Digital Marketing" MOOC on SWAYAM Portal of UGC, https://swayam.gov.in/nd2_cec20_mg29/preview

Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
	2.5	3	3	3	3	3	3	2

CO- PSO

	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

CO –PO- PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Co 1	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	2.5	3	3	3	3	3	3	2	3	3	3	3	3

OPTIONAL SPECIALIZATION

HUMAN RESOURCE

CC-MHMCT-7 G, H, I

CC-MHMCT-7 G STRATEGIC HRM

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Examining significance of strategic human resource management.
- Co 2: Understanding the ways of implementation of SHRM.
- Co 3: Examining various strategies in relation to human resources.
- Co 4: Understanding strategic knowledge management and its dimensions.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**Strategic human resource management**: Concept, impact of globalisation on HRM, changing nature of workforce; Development of Strategic Human Resource Management, Models of Strategic Human Resource Management, Development of HR strategies, challenges in Strategic Human Resource Management, advantages of Strategic Human Resource Management, impact of HRM. Global human resource management.	**CO 1**
UNIT-II	**Strategic HR Implementation in hotels**: Staffing; training & development; Impacts of strategic human resource management on performance, process of strategic human resource management; Compensation, employee separation. Human side of mergers & acquisitions; Model of merger & acquisitions.	**CO 2**
UNIT-III	**HR Strategy**: Components of strategic HRM; organizational HR strategies; Functional human resource strategies; improving business performance through strategic HRM;	**CO 3**

	Employee engagement; Ways of achieving employee engagement, drivers of employee engagement.	
UNIT-IV	**Strategic knowledge management**: Building knowledge management into strategic framework; knowledge sharing as a core competency; Human resource dimensions to knowledge management; strategic approach to industrial relations; outsourcing & its HR implications, Human resource outsourcing.	**CO 4**

SUGGESTED TEXT BOOKS

- Aswthppa, Human Resurce Management. TMH. ND
- Cases & Games. Himalaya Publishing House.
- Casio Wayne F. Managing Human Resource. MGH. ND

SUGGESTED REFERENCE BOOKS

- Dressler, Gary Human Resource Management. Pearson Education Asia, ND
- John, Human Resource Management lrwin/MGH
- Mondy R. W., Noe R.M Premeaux S and Mondy J.B., Human resource Management, PHI.
- Malay, B., Human Resource Management in Hospitality Management, Oxford Publications.
- Ramaswamy E Managing Human Resources Oxford University Prss, ND
- Rao, VSP, Human Resource Management –Text &Cas. s. Exeel Book, ND
- Sharma, E., Strategic Human Resource Management and Development, Pearson
- SubbaRao, Essentials of Human Resource Management & industrial relations Text.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	2	1	2	2	1
Co 2	3	3	2	2	2	2	2	1
Co 3	2	2	2	2	2	2	2	1
Co 4	2	2	2	2	1	2	2	1
	2	2	2	2	1.5	2	2	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	1	2	2	1
Co 2	2	1	2	2	1
Co 3	2	1	2	2	1
Co 4	2	1	2	2	1
	2	1	2	2	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	2	1	2	2	1	2	1	2	2	1
Co 2	3	3	2	2	2	2	2	1	2	1	2	2	1
Co 3	2	2	2	2	2	2	2	1	2	1	2	2	1
Co 4	2	2	2	2	1	2	2	1	2	1	2	2	1
	2	2	2	2	1.5	2	2	1	2	1	2	2	1

CC-MHMCT-7 H TRAINING & DEVELOPMENTS IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Examining significance of training and development.
- Co 2: Understanding the need, design and implementation of training in hotels.
- Co 3: Learning and evaluating training in hotel industry.
- Co 4: Understanding management development, contemporary issues and trends.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**Training & Development:** Scope, objectives, beneficiaries, forces influencing working and learning, training practices in hotels. **Strategic training and development process:** organizational factors influencing training, training needs in different strategies, models of organizing training department, outsourcing training.	**CO 1**
UNIT-II	**Training Needs Assessment:** Importance, scope, methods and techniques of training need assessment, training need assessment: organizational and operational analysis. **Training Design and implementation:** Factors affecting training design, budgeting for training, design theory, outcomes of design, considerations in designing effective training programs, training implementation.	**CO 2**
UNIT-III	**Learning:** Learning theories, learning process, feedback, methods of training and trainer's style, types of training, training do's and don'ts for trainers.	**CO 3**

	Training Evaluation: Factors influencing transfer of learning, reasons for evaluating training, evaluation process, evaluation techniques, models of training evaluation, training audit.	
UNIT-IV	**Management Development:** Need, importance, training for executive level management, approaches, development planning process, strategies for providing development in hotels. **Contemporary Issues in Training and Development:** issues relating to training in hotels, E-Learning and use of technology in training, problems & future trends in training.	**CO 4**

SUGGESTED TEXT BOOKS

- Aswthppa, Human Resurce Management. TMH. ND
- Cases & Games. Himalaya Publishing House.
- Dressler, Gary Human Resource Management. Pearson Education Asia, ND

SUGGESTED REFERENCE BOOKS

- Malay, B., Human Resource Management in Hospitality Management, Oxford Publications.
- Rao, VSP, Human Resource Management –Text &Cas. s. Excel Book, ND
- Raymond, A. Noe (2010), Employee training and development, Tata McGraw Hill Pulications.
- Sahu R.K., (2010), Training for development, Excel Books, New Delhi
- Sharma, E., Strategic Human Resource Management and Development, Pearson
- SubbaRao, Essentials of Human Resource Management & industrial relations Text.

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	2	2	1	1	1	2	1
Co 2	2	2	2	1	1	1	2	1
Co 3	2	2	2	1	1	1	2	1
Co 4	2	2	2	1	1	1	2	1
	1.75	2	2	1	1	1	2	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	2	2	1	1
Co 2	2	2	2	1	1
Co 3	2	2	2	1	1
Co 4	2	2	2	1	1
	2	2	2	1	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	1	2	2	1	1	1	2	1	2	2	2	1	1
Co 2	2	2	2	1	1	1	2	1	2	2	2	1	1
Co 3	2	2	2	1	1	1	2	1	2	2	2	1	1
Co 4	2	2	2	1	1	1	2	1	2	2	2	1	1
	1.75	2	2	1	1	1	2	1	2	2	2	1	1

CC-MHMCT-7 I EMPLOYEE MOTIVATION AND WELFARE IN HOTELS

Credits –06
External Marks -80
Internal Marks -20
TotalMarks-100

COURSE OBJECTIVES:

- Co 1: Examining significance of employee motivation in hotels.
- Co 2: Understanding the job evaluation, appraisal, employee compensation and benefits.
- Co 3: Examining measures of employee welfare and social security in hotel industry.
- Co 4: Understanding concerns related to employee safety and health.

APPROACHES:

Lectures, Group Discussions, Presentations, Practical, case studies, Business Games.

REQUIREMENTS:

Regular attendance and active participation during the course of the semester: Books and literature Surveys, Long essays and assignments; seminar presentations etc.

EVALUATION:

The performance of the students will be evaluated on the basic of class participation; house tests; regularity and assignment carrying 20 percent of the credit and the rest though Terminal Examination (3 hours duration).

MODE OF PAPER SETTING:

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions.

UNIT-I	**Employee Motivation**: Job design, work scheduling, nature of motivation, motivational theories, process theories of motivation, morale and productivity, job evaluation.	**CO 1**
UNIT-II	**Job Evaluation:** concept, essentials for the success of job evaluation. **Performance Appraisal:** process, methods and feedback system. **Compensation Administration:** Objectives, components, factors influencing compensation levels. **Employee Benefits:** Organizational incentive plans, fringe benefits and its various types.	**CO 2**
UNIT-III	**Employee Welfare**: Importance, agencies for welfare work, types of welfare activities, statutory provisions. **Social Security**: Introduction, types, social security in India, The Workmen's Compensation Act.	**CO 3**
UNIT-IV	**Employee Safety**: Need for safety, safety programme, supervisor's role, and major accidents in hotels. **Employee Health**: problems and related remedies, preventive	**CO 4**

	measures, benefits and compensation,Legislation related to health and safety in India.	

SUGGESTED TEXT BOOKS

- Aswthppa, Human Resurce Management. TMH. ND
- Cases & Games. Himalaya Publishing House.
- Casio Wayne F. Managing Human Resource. MGH. ND

SUGGESTED REFERENCE BOOKS

- Dressler, Gary Human Resource Management. Pearson ducation Asia, ND
- John, Human Resource Management lrwin/MGH
- Mondy R. W., Noe R.M Premeaux S and Mondy J.B., Human resource Management, PHI.
- Malay, B., Human Resource Management in Hospitality Management, Oxford Publications.
- Ramaswamy E Managing Human Resources Oxford University Prss, ND
- Rao, VSP, Human Resource Management –Text &Cas. s. Exeel Book, ND
- SubbaRao, Essentials of Human Resource Management & industrial relations Text,

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	2	2	2	2	1	2	2	1
Co 2	3	3	2	2	2	2	2	1
Co 3	2	2	2	2	2	2	2	1
Co 4	2	2	2	2	1	2	2	1
	2	2	2	2	1.5	2	2	1

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	2	1	2	2	1
Co 2	2	1	2	2	1
Co 3	2	1	2	2	1
Co 4	2	1	2	2	1
	2	1	2	2	1

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	2	1	2	2	1	2	1	2	2	1
Co 2	3	3	2	2	2	2	2	1	2	1	2	2	1
Co 3	2	2	2	2	2	2	2	1	2	1	2	2	1
Co 4	2	2	2	2	1	2	2	1	2	1	2	2	1
	2	2	2	2	1.5	2	2	1	2	1	2	2	1

	SEMESTER IVTH & VIVA VOCE	
Dissertation **The dissertation should be from the specialization opted by the student.** **It can be quantitative or qualitative.** **<u>FORMAT OF DISSERTATION CHAPTERS</u>** **1. INTRODUCTION** **2. REVIEW OF LITTERATURE** **3. RESEARCH MEDHODOLOGY** **4. DATA ANALYSIS & INTERERETATION** **5. CONCLUSION**		**CREDITS - 12** **MAXIMUM MARKS - 300**

Revised Scheme of Examinations for B.Sc. Home Science (IIIrd and IVth Semester) under (CBCS-LOCF) w.e.f. 2021-22

Semester-III

Course	Paper Code	Nomenclature	Credits	Contact Hr/week	Exam time (hr)	External Marks	Internal Marks	Total
CC7	HS301-A	Introduction to textile & Clothing Construction	3	3	3	60	15	75
	HS301-B	Laundry Science & Finishing of Fabrics	3	3	3	60	15	75
	HS301-(A+B)	Clothing & TextilesPractical	2	4	3	50	-	50
CC8	HS302-A	Housing and space management	3	3	3	60	15	75
	HS302-B	Interior Design & home décor	3	3	3	60	15	75
	HS302-(A+B)	Home Management Practical	2	4	3	50	-	50
CC9	HS303-A	Early Childhood Education & Children with special needs	3	3	3	60	15	75
	HS303-B	Family transition and population education	4	4	3	80	20	100
	HS303-(A)	Human Development Practical	1	2	3	25	-	25
SEC-1	HS305	Personality Development	2	2	3	40	10	50
Total			26	31				650

Semester-IV

Course	Paper Code	Nomenclature	Credits	Contact Hr/week	Exam time (hr)	External Marks	Internal Marks	Total
CC10	HS401-A	Nutrition in Life Cycle	3	3	3	60	15	75
	HS401-B	Food preservation and Community Nutrition	3	3	3	60	15	75
	HS401-(A+B)	Foods &Nutrition Practical	2	4	3	50	-	50
CC11	HS402-A	Life Span Development-II	3	3	3	60	15	75
	HS402-B	Adulthood; Guidance & Counseling	3	3	3	60	15	75
	HS402-(A+B)	Human Development Practical	2	4	3	50	-	50
CC12	HS403-A	Community Development and Extension Education-I	3	3	3	60	15	75
	HS403-B	Community Development & Extension Education-II	3	3	3	60	15	75
	HS403-C	Computer Applications in Communication & Media Design Practical	2	4	3	50	-	50
SEC-2	HS404	Basics of Physics	2	2	3	40	10	50
Total			26	32				650

Programme Outcomes (POs) for UG courses of Faculty of Life Sciences

1. To develop skills in graduate students to be able to acquire theoretical and practical knowledge in fundamentals of biology in respective disciplines of plants, animals, microbes and environment.
2. To inculcate the ability to critically evaluate problems and apply lateral thinking and analytical skills for professional development.
3. To create awareness on ethical issues, good laboratory practices and biosafety.
4. To develop ability in youth for understanding basic scientific learning and effective communication skills.
5. To prepare youth for careers in teaching, industry, government organizations and self-reliant entrepreneurship.
6. To make students aware of natural resources and environment and its sustainable utilization.
7. To provide learning experience in students that instills deep interest in biological science for the benefit of society.

Programme Specific Outcomes (PSOs) for B.Sc. Home Science

1. **PSO1:** To impart knowledge and facilitate the development of skills and techniques in different areas of Home science (namely Foods, nutrition & dietetics, Human development, Textile and fashion technology and community resource management) required for personal, professional and community advancement.
2. **PSO2:** To inculcate in students values and attitudes that enhance personal and family growth and to sensitize them to various social issues for the development of human society.
3. **PSO3:** To promote in students a scientific temper and competencies in research to enable contribution to the national and international knowledge base in Home science and allied fields.
4. **PSO4:** Consequently, to empower our women students such that they are able to effect positive changes at multiple levels.

B.Sc. (HOME SCIENCE)
SEMESTER – III
CC7: Introduction to Textile and Clothing Construction

Course No.: HS 301-A **MM: 60+15=75**
Duration of Exam: 3 Hrs.
Course Credit: 3

Instructions for the Examiner:
The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.

Instructions for the Candidate:
The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.

Course Outcomes: The outcomes for this course are:
CO1: To acquire knowledge about different types of fibers, yarns and blends.
CO2: To understand the process of fabric manufacture and fabric properties.
CO3: To develop creative skills for fabric construction.
CO4: To gain practical knowledge of Instruments and their application.

UNIT-I

1. **Textile Fibers:** Definition, Classification, Physical and chemical properties of different fibers
   a) Natural Fibers: Cotton, Linen, Wool and Silk
   b) Man-made Fibers: Rayon-viscose, Acetate, Polyester, Acrylic, Nylon
2. **Yarns:**
   - Definition, classification
   - Types of yarns: Simple, novelty and textured yarns.
   - Basic principle of yarn making: Mechanical spinning Chemical spinning (wet, dry and melt).
   - Properties of yarns: Yarn numbering systems and twist
3. **Blends:** Types of blends and purpose of blending.

UNIT-II

4. **Fabric Construction**: Methods and Techniques of fabric construction
   a) From yarns: Weaving, Knitting, Braiding, Crocheting, Lacing, Netting, Knotting.
   b) From fibers: Felting, Non-woven.
   c) From solutions: films, foams, paper
   d) From layering/Composites: double weaving, quilting, bonding, laminating.
5. **Weaving:** Parts and functions of the loom
· Basic Weaves: Classification, construction, characteristics, usage and types
6. **Knitting:**
   a) Classification, construction, characteristics, usage and types warp knits and weft knits
   b) Comparison of knitting with weaving.
   c) Comparison between woven and non-woven.
. d) Non-woven and felts-construction, properties and usage.

References:

1. "A Reader's Digest Step by Step guide- Sewing and Knitting", Reader's Digest (Australia) Pty Ltd.
2. Barker A. F. & Midgley E. "Analysis Woven Fabrics" Abhishek Publications, Chd, India (2007)
3. Dan Tyagi.S , "Fundamentals of Textiles and their Care," Orient Longman Ltd, New Delhi.
4. Corbman, "Textile fiber to Fabric"; MCGraw Hill
5. Murphy W.S. " Textile Weaving & Design" Abhishek Publications, Chandigarh, India(2007).
6. "Textbook of clothing, textiles, laundry" Kalyani publishers, New Delhi.

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 301-A: Introduction to Textile and Clothing Construction

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1.5	1.5	2	2	3	1.5
CO2	2.5	1.5	2	1.5	3	2	1.5
CO3	2	1.5	2	1.5	2.5	2	2
CO4	2.5	2	2	1.5	3	2	2
Average	2.5	1.6	1.8	1.6	2.6	2.2	1.7

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 301-A: Introduction to Textile and Clothing Construction

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	1.5	2	2.5
CO2	2.5	1.5	2	2
CO3	3	1.5	2	2
CO4	3	1.5	2	2
Average	2.8	1.5	2	2.1

B.Sc. (HOME SCIENCE)
Clothing & Textiles Practical
CC 7: Introduction to Textile and Clothing Construction

Course No.: HS 301-A

MM: 25
Duration of Exam: 3 Hrs
Course Credit:1

Course Outcomes: The outcomes for this course are:

CO1: To gain knowledge about identification of fibers.
CO2: To develop skills for weaving and knitting.
CO3: To enhance knowledge of fabric construction.

Syllabus:

1. Identification of fibers- microscopic test, burning test, chemical test
2. Weaving samples – plain weave, rib weave, basket weave, twill weave, satin weave, sateen weave
3. Knitting samples – garter, stocking, rib, purl, moss, doble rib, double moss.
4. Garment construction –
   - Adaptation of child's bodice block to any one type from A-line frock, gathered frock, flared frock
   - Drafting of collars (baby, Chinese band, cape, peter pan, flat, flack and raised) and sleeves (puff, flared, leg-o-mutton, raglan, dolman, kimono).
   - Preparation of adult's bodice block and sleeve block and its adaptation to Blouse
   - Drafting, cutting and stitching of petticoat, salwar , kameez.

References

1. Barker A. F. & Midgley E. "Analysis Woven Fabrics" Abhishek Publications, Chd, India (2007)
2. Dan Tyagi.S , "Fundamentals of Textiles and their Care," Orient Longman Ltd, New Delhi.
3. Corbman, "Textile fiber to Fabric"; MCGraw Hill
4. Murphy W.S. "Textile Weaving & Design" Abhishek Publications, Chandigarh, India (2007).
5. "Textbook of clothing, textiles, laundry" Kalyani publishers, New Delhi.
6. Sekhri S., (2013) Textbook of Fabric Science: Fundamentals to Finishing, PHI Learning, Delhi.
7. Vilensky G., (1983) Textile Science, CBS Publishers and Distributors, Delhi.

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 301-A (Practical): Introduction to Textile and Clothing Construction

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1.5	2	1.5	2	1.5	1.5
CO2	2	1.5	1.5	2	2	1.5	1.5
CO3	2	1.5	1.5	2	2	1.5	1.5
Average	2	1.5	1.2	1.3	2	1.5	1.5

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 301-A(Practical): Introduction to Textile and Clothing Construction

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	1.5	2	2
CO2	3	1.5	2	2
CO3	3	1.5	1.5	2
Average	3	1.5	1.3	2

B.Sc. (HOME SCIENCE)
SEMESTER – III
CC7: Laundry Science and Finishing of Fabrics

Course No.: HS 301-B

MM: 60+15=75
Duration of Exam: 3 Hrs.
Course Credit: 3

Course Outcomes: The outcomes for this course are:

CO1. To aware the students about the techniques of laundry and washing.
CO2. To know about various laundry auxiliaries and their usage.
CO3. To gain knowledge about different types of finishes.
CO4. To understand the importance of care labels and labeling act.

UNIT- I

1. **Laundry:** Definition & importance of laundry
   a) Equipment – laundry equipment, drying equipment, storage equipment, finishing equipment.
   b) Principles, methods, types of washing – sorting, steeping, friction (hand, scrubbing board and brush), suction washing, kneading, squeezing and machine washing.
   c) Bleaches- oxidizing, reducing, optical bleach and their stability to different fibers.

2. **Stiffening agents:**
   a) Kinds of stiffening agents – rice, wheat, maize, tapioca, potato and commercial
   b) starch.
   c) Starch substitutes

3. **Laundry blues –** soluble and insoluble
   a) Process of bluing
   b)Additional reagents – alkaline, acidic, organic solvents and absorbents.

4. **Laundry Supplies-**
   a) Soaps and detergents: Definition, types and difference between soap and detergent
   b) Qualities of soaps and its action

5. **Finishing:** Definition & Importance of finishing

   · Classification/types of finishes - mechanical, chemical, preparatory &functional finishes

Unit -2

6. **Dyeing-**
   - Definition of Dyes and pigment.
   - Types of dyes- a) Natural dyes (vegetable, animal, mineral)
     b) Synthetic dyes (direct, basic, acid, Sulphur, mordant, vat, color or dyes, disperse dyes, reactive, pigment).
   - Methods of dyeing – home dyeing, resist dyeing (batik, tie and dye).
   - Different styles of tying for tie and dye.

7. **Printing –**
   - Definition, types (hand and machine) and Methods of printing
   - Direct – block, roller, duplex, flocking
   - Discharge Printing
   - Resist Printing – stencil, screen (flat, rotary)
   - Indirect Printing – heat transfer, photo

8. **Stains Identification and removal of common stains –**
   - Types – vegetables, animal, fat, dye, mineral stains.
   - Methods of removal of different stains

9. **Dry cleaning &Care of Textiles**
10. **Labeling and labeling Act**

References:

1. Corbman, P.B., (1985) Textiles- Fiber to Fabric (6th Edition), Gregg Division/McGraw
2. Hill Book Co., US.
3. Joseph, M.L., (1988) Essentials of Textiles (6th Edition), Holt, Rinehart and Winston Inc.,
4. Florida.
5. Sekhri S., (2013) Textbook of Fabric Science: Fundamentals to Finishing, PHI Learning,
   a. Delhi.
6. Tortora, G. Phyllis, Understanding Textiles, McMillan Co. USA.
7. Vilensky G., (1983) Textile Science, CBS Publishers and Distributors, Delhi.
8. 6. Sushma Gupta, Neeru Garg and RenuSainiTest book of clothing and textiles and laundry – Kalyani Pub.
9. 7. Gupta Sushma (2005) TextBook of Clothing Textiles and Laundry, Kalyani Publishers New Delhi.

Mapping of Course Outcomes with Program Outcomes (CO/PO)

Paper No. HS 301-B Laundry Science and Finishing of Fabrics

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1.5	1.5	2.5	2	2.5	2.5	2
CO2	1.5	1.5	2.5	2	2	2	2
CO3	2	1.5	2	1.5	2	1.5	1.5
CO4	1.5	1	1.5	1	1.5	1.5	1
Average	1.6	1.3	2.1	1.6	2	1.8	1.6

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)

Paper No. HS 301-B Laundry Science and Finishing of Fabrics

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2
CO2	2.5	1.5	2	2
CO3	2.5	1.5	2	1.5
CO4	2	1.5	1.5	2
Average	2.5	1.6	1.8	1.8

B.Sc. (HOME SCIENCE)
Clothing & Textiles Practical
CC7: Laundry Science and Finishing of Fabrics

Course No.: HS 301-B

MM: 25
Duration of Exam: 3 Hrs
Course Credit:1

Course Outcomes: The course learning outcomes for this course are –
CO1. To gain knowledge about equipment and supplies used for laundry and washing.
CO2. Provide understanding of finishes given to different fabrics.
CO3. To understand the different techniques of dyeing and printing.
CO4. To know about the nature of stains and methods of removing stains.

Syllabus:

1. Demonstration of laundry equipment and laundry reagents
2. Washing, care and storage of textiles:
   - Laundry and finishing of cotton, wool, silk and synthetic fabrics.
3. Making samples of tie and dye with different methods (min 12)
   - Prepare one article of tie and dye.
4. Batik with wax and without wax (one article of each).
5. Printing- block printing, stencil printing, screen printing.
   - Prepare one article from each.
6. Identification of stains and removal of stains from different fabrics (min 12).
7. Free Hand Painting.

References:

1. Corbman, P.B., (1985) Textiles- Fiber to Fabric (6th Edition), Gregg Division/McGraw Hill Book Co., US.
2. Joseph, M.L., (1988) Essentials of Textiles (6th Edition), Holt, Rinehart and Winston Inc.,Florida.
3. Sekhri S., (2013) Textbook of Fabric Science: Fundamentals to Finishing, PHI Learning, Delhi.
4. Tortora, G. Phyllis, Understanding Textiles, McMillan Co. USA.
5. Wilensky G., (1983) Textile Science, CBS Publishers and Distributors, Delhi.
6. Sushma Gupta, Neeru Garg and Renu Saini Test book of clothing and textiles and laundry – Kalyani Pub.
7. Gupta Sushma (2005) Textbook of Clothing Textiles and Laundry, Kalyani Publishers New Delhi.

Mapping of Course Outcomes with Program Outcomes (CO/PO)

Paper No. HS 301-B (Practical) Laundry Science and Finishing of Fabrics

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2.5	1.5	2	1.5	2	1.5	1.5
CO2	2.5	1.5	2	1.5	2	1.5	1.5
CO3	2	1.5	2	1.5	1.5	1.5	1.5
CO4	2	1.5	2	1.2	1.5	2	2
Average	2.2	1.5	2	1.4	1.7	1.6	1.6

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)

Paper No. HS301 -B (Practical) Laundry Science and Finishing of Fabrics

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1.5	2
CO2	2.5	1.5	2	2
CO3	3	1.5	2	2
CO4	2	1.5	1.5	2
Average	2.6	1.6	1.7	2

B.Sc. (HOME SCIENCE)
SEMESTER – III

CC8: Housing and Space Management

Course No.: HS 302-A

MM: 60+15=75
Duration of Exam: 3 Hrs.
Course Credit: 3

Instructions for the examiner : The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate: The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.
Course Outcomes: The outcomes of this course are:

CO1: To learn the relationships that characterize art and design practice.
CO2: To enable the students to explore theories and apply principles of aesthetics and art criticism to theorize their own artwork.
CO3: To encourage experimentation with traditional and contemporary materials, technical processes and methods.
CO4: To impart knowledge and skills for making different floor plans for different income groups.

UNIT-I

1. Concept and importance of housing, housing needs of family, advantage and disadvantage of owned and rented house
2. Choice of site for house and factors affecting site selection
3. Conventional and non- conventional building material for construction of a house
4. Modern methods of house construction and energy saving houses
5. House loan and fund arrangement from banks (Nationalized, Private), LIC, Co-operative societies.

UNIT-II

6. Types of house plan: floor, elevation, structural, perspective and landscape
7. Signs used for reading house plans for LIG, MIG and HIG
8. Space planning for different rooms: living room, dining room, bedroom, kitchen, entrance passage, lobby, toilet, staircase, exteriors etc.
9. Principles of space planning: aspect, orientation,grouping, privacy, roominess, prospect, light, ventilation, flexibility, circulation and economy.

References:

1. Goldstein,H.andGoldstein,V(1967): Art in Everyday life; New Delhi: Oxford and IBH publishing company .Lawrence M, (1987), Interior Decoration, New Jersey: Chartwell Books.
2. Riley &Bayen., (2003), The Elements of Design, Mitchell Beazley.
3. Rutt Anna Hong (1961): Home furnishing,Wiley Eastern Pvt.Ltd.
4. Adler, David., 2004,Metric HandBook planning & Design, Architectural press.
5. Kumar, Sushil, 2008, Building Construction, Standard publisher.

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 302 - A: Housing and Space Management

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2.5	1.5	2	1.5	2	1.5	1.5
CO2	2.5	1.5	2	1.5	2	1.5	1.5
CO3	2	1.5	2	1.5	1.5	1.5	1.5
CO4	2	1.5	2	1.2	1.5	2	2
Average	2.2	1.5	2	1.4	1.7	1.6	1.6

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 302 - A: Housing and Space Management

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1.5	2
CO2	2.5	1.5	2	2
CO3	3	1.5	2	2
CO4	2	1.5	1.5	2
Average	2.6	1.6	1.7	2

B.Sc. (HOME SCIENCE)
Home Management Practical
CC8: Housing and Space Management

Course No.: HS 302-A

MM: 25
Duration of Exam: 3 Hrs
Course Credit:1

Course Outcomes: The course learning outcomes for this course are –

CO 1. To gain knowledge about layout of furniture, interior decoration, use of waste material, decorative pieces .
CO 2. To develop understanding about aesthetics.
CO 3. To acquire professional and entrepreneurial skills for economic empowerment.

Syllabus:

1. Preparation of house plans for different income groups (one each)
2. Layout of furniture for different rooms/areas.
3. Floor decoration: Alpana and rangoli.
4. Pottery painting and decoration.
5. Creating various art pieces/accessories using various types of materials and techniques like paper cutting, collage, candle making, , papier-mâché, macramé, gift wrapping, greeting cards with decorative envelopes , shopping bags/decorative pouches, accessories for fashion designing including Jewellery making (any 6).
6. Table setting and napkin folding.
7. Flower arrangement for different rooms and occasions.
8. Use of waste materials for making utility and decorative articles.

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 302-A Practical: Housing and Space Management

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1.5	2	1.5	2	1.5	1.5
CO2	2	1.5	1.5	2	2	1.5	1.5
CO3	2	1.5	1.5	2	2	1.5	1.5
Average	2	1.5	1.2	1.3	2	1.5	1.5

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 302-A Practical: Housing and Space Management

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	1.5	2	2
CO2	3	2.5	2	2
CO3	3	2	2	2
Average	3	2	2	2

B.Sc. (HOME SCIENCE)
SEMESTER – III
CC8: Interior Design & Home Decor

Course No.: HS 302-B **MM: 60+15=75**
Duration of Exam: 3 Hrs.
Course Credit: 3

Instructions for the examiner : The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate: The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.

Course Outcomes: The outcomes of this course are:
CO1: To develop skills, abilities & knowledge that enable artistic production & creative problem solving skills.
CO2: To develop and apply concepts of art & design to create aesthetically pleasing interiors.
CO3: To impart knowledge & skills for aesthetic appreciation & evaluation

UNIT-I

1. Objectives of interior decoration: Elements of art and their importance in interior decoration
2. **Types of design:** structural and decorative and its application
3. **Elements of design:** line, shape, texture, light, colour, form, space and its application in interior decoration
4. **Principles of design:** Rhythm, balance, proportion, emphasis, harmony
5. **Colour:** Properties of colour, psychological effect of colour, color schemes and its application in the interior of a house.
6. **Flower arrangement:**
   a) Different types of Flower arrangement
   b) Accessories used and points to be considered for flower arrangement
   c) Flower decoration for different occasions

UNIT-II

7. **Table setting and table manners:** Informal and formal table settings (buffet style, Indian style restaurant style, Cafe style)
8. **Furniture:** Types of furniture, materials and finishes of furniture, furniture arrangement for different areas; factors affecting the selection and purchase of furniture, care and maintenance of furniture
9. **Furnishings:**
   Soft Furnishing (curtains, cushions, pillow and material for upholstered furniture)
   Wall treatment and its types
   Window treatment and decoration
   Types of floor coverings
10. **Lighting:**
    a) Types and requirement for various activities
    b) Lighting fixtures in the home – Incandescent lamp, Fluorescent tube, CFL, LED, Halogen lamp

References:

1. Lawrence M, (1987), Interior Decoration, New Jersey: Chartwell Books.
2. Riley &Bayen., (2003), The Elements of Design, Mitchell Beazley.
3. Rutt Anna Hong (1961): Home furnishing,Wiley Eastern Pvt.Ltd.
4. Bhat Pranav and Goenka Shanita (1990): The foundation of art and Design, Bombay: Lakhani Book Depot.
5. Goldstein,H.andGoldstein,V(1967): Art in Everyday life; New Delhi: Oxford and IBH publishing company .

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No.HS 302-B Interior Design & Home Decor

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2.5	2	2.5	2	2.5	2.5
CO2	2	2.5	1.5	2	2	1.5	1.5
CO3	2	2.5	3	2.5	2	2.5	2.5
Average	2	2.5	2.2	2.3	2	2.2	2.2

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No.HS 302-B Interior Design & Home Decor

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	1.5	2	3
CO2	3	2.5	2	2.5
CO3	3	3	3	2
Average	3	2.3	2.3	2.5

B.Sc. (HOME SCIENCE)
Home Management Practical
CC8: Housing and Space Management

Course No.:HS 302-B **MM: 25**
Duration of Exam: 3 Hrs
Course Credit: 1

Course Outcomes: The outcomes of this course are:

CO1: To develop professional skills for interior designing & decoration.
CO2: To learn aesthetics & its application in different surroundings.
CO3: To make students aware of natural resources and its sustainable utilization.

Syllabus:

1. Rendering for different surfaces like trees, twigs, stones, wood, plastic, brick, waste material, glass, concrete etc using different types of paints and colours.
2. Preparation of portfolio based on market review of furniture and furnishing materials, wall coverings and decoration , floor covering and decoration , window and door treatment , lighting system , wood and its substitute and various artifacts like ceramics, frames , sculptures , handicraft, flower vase etc.
3. Preparation of catalogue comprising color wheel, planning color schemes for different rooms and application of elements of design in interiors of house.

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 302-B Practical: Interior Design & Home Decor

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2.5	2	2.5	2	2.5	1.5
CO2	2	2.5	2.5	2	2	2.5	2.5
CO3	2	3	2.5	3	2	2.5	2.5
Average	2	2.7	2.3	2.5	2	2.5	2.2

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 302-B Practical: Interior Design & Home Decor

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	1.5	2	2
CO2	3	2.5	2	2.5
CO3	3	2.5	3	2
Average	3	2.2	2.3	2.2

B.Sc. (HOME SCIENCE)
SEMESTER – III
CC9: Early Childhood Education & Children with Special Needs

Course No.: HS 303-A **MM: 60+15=75**
Duration of Exam: 3 Hrs.
Course Credit: 3

Instructions for the examiner : The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate: The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.

Course Outcomes: The outcomes of this course are:

CO1: To sensitize the students to the special group of society whose needs are special in nature.
CO2: To understand the needs, educational provisions and attitude of society toward mentally retard, physically challenged and gifted children.
CO3: To get theoretical and practical knowledge about different types of early childhood education centers and their importance.
Co4: To acquaint with skills of establishing preschools by learning principles of programme planning and historical development of early childhood education

UNIT – I

1. Importance, objectives, scope of early childhood education, types of early childhood education centres (traditional and laboratory nursery school, Montessori school, Balwadi and Anganwadi)
2. **Preschool program**: Importance of Curriculum, principles of preschool program, activities in preschool program
3. Selection of play equipment (outdoor and indoor)
4. Role and qualities of good nursery teacher

UNIT - II

5. **Definition**: Disability, impairment, handicapped and disorder
6. Classification, causes, symptoms of following:-
    - Sensory impairment (visual, hearing)
    - Physical impairment (locomotor, autism, speech, cerebral palsy)
    - Intellectual impairment (mental retardation, gifted children)
    - Learning impairment (dyslexia)
    - Emotional impairment
7. Counseling and types of therapy for children with special needs
8. Welfare programmes for children with special needs

References:

1. Srivastava S., Rani K.S. (2014): Textbook of Human Development, S.Chand publication, New Delhi
2. See Felett: C. (1980): A curriculum for preschools, Columbus: charles E. Merrill Publishing company
3. Berdine, W.H., Blackhurst, AE (1985): An introduction to special education (second ed.) Lexington, Harper Collins,
4. Hallahan, D.P. & Kauffman, J.M. (1991): Introduction to exceptional children (fifth ed.) Boston, Allyn and Bacon,
5. Loring J. & Burn, G. (eds) (1978): Integration of handicapped children in society, London, Routledge & Kegan Paul
6. Narasimhan, M.C.& Mukherjee, A.K.(1986): Disability; a continuing challenge
7. Werner,D.(1994): Disabled Village Children, (Indian edition),Voluntary Health Association of India,
8. Philip, M.&Duckworth,D.(1985): Children with disabilities and their families: a review of research, Windsor,Berks:NFER-NELSON Publishing Co.,
9. Cole,M,&Cole, S(1993): The development of children. New York Scientific American Books.
10. Kumar,K.(1993): Study of childhood and family. In T.S Saraswathi & B. Kaur (Eds).Human development and family studies in India: An agenda for research and policy New Delhi:Sage.
11. Lerner: R.M.&Hotsch,D.F (1983): Human development :A life-span perspective.New York: McGraw Hill.,
12. Saraswathi,T.S,Verma,A,&Kalra,D (1988) : Issues in child development, Bombay: Somaya.
13. Berk, Laura E (1999). Child Development. Prentice Hall of India, Private Ltd. New Delhi.

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No. HS 303-A Early Childhood Education & Children with special needs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	1	2	2	2	3
CO2	3	3	2	1	2	3	3
CO3	3	3	2	3	3	2	3
CO4	2	3	3	3	3	2	3
Average	2.5	2.75	2.0	2.25	2.5	2.25	3.0

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 303-A Early Childhood Education &Children with special needs

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2
CO2	3	2	3	2
CO3	3	3	3	3
CO4	3	3	3	3
Average	3.0	2.5	2.75	2.5

B.Sc. (HOME SCIENCE)

Human Development Practical
CC9: Early Childhood Education & Children with Special Needs

Course No.: HS 303-A

MM: 25
Duration of Exam: 3 Hrs
Course Credit:1

Course Outcomes: The outcomes of this course are:

CO1. To learn methods of child study for analyzing and improving the quality of life.
CO2. To acquire professional skills in the field of Human Development.

Syllabus :

1. Methods of child study and report writing on working of anganwadi, montessori, preschool, nursery, balwadi (any three)
    - Visit to nursery schools and case study of preschool children.
    - Report writing based on survey of welfare agencies working for special need children,
    - Observation of disability in childhood (any one); observation and report writing in School, outdoor circumstances/ home setting

2. Preparation of creative art activity file, chart, poster, storybook/ poem book etc. for normal and special need children (one each)

3. Preparation of baby records /albums.

4. Preparation of teaching aid and its practical use in nursery school settings for special need Children.

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 303-A (Practical) : Early Childhood Education & Children with Special Needs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	2	2	2.5
CO2	3	3	3	3	2	3	3
Average	3	2.5	3	2.5	2	2.5	2.75

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 303-A (Practical): Early Childhood Education & Children with Special Needs

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2.5	2.5	3
CO2	3	2.5	3	2
Average	3	2.5	2.75	2.5

B.Sc. (HOME SCIENCE)
SEMESTER – III

CC9: Family Transition and Population Education ·

Course No.: HS 303-B **MM: 80+20=100**
Duration of Exam: 3 Hrs.
Course Credit: 4

Instructions for the examiner: The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate: The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.
Course Outcomes: The outcomes of this course are:
CO1: To analyze the effects of population blast on the economy.
CO2: To know about the stages of family and the significance of changed faces of families in India.
CO3: To learn about methods and the importance of family planning
CO4: To understand the status of children and women in India.

UNIT – I

1. **Family**: Meaning, Types and Functions of family
2. **Marriage**: Definition, Meaning and Functions of marriage
   Types and forms of marriages in India
   Criteria for Mate selection and factors affecting mate selection,
   Marital adjustments: Factors influencing marital adjustment
3. **Family transitions and its advantages and disadvantages**:
   a) Nuclear, Joint and Extended families
   b) Live in relationship
   c) Single parenthood: Occupation related separation and Single parenthood by adoption , Employment of mother , Divorce, Death of a spouse

4. **Issues related to children in different circumstances**:
   a) Child abuse
   b) Child welfare services
   c) Child trafficking
   d) Child rights
   e) Street children, working children and homeless children

UNIT-II

5. **Population Education**: Definition, Population blast and its effects, population statistics (sex ratio, literacy rate, mortality rate, morbidity rate according to latest census) with reference to child and women in India.
6. **Sex education**: Need, importance and issues.
7. **Family planning** : Methods, Small family norms.
8. Reproductive rights of women, Health programs related to child and women, current family welfare programs in India.

References:

1. Augustine, J.N. (Ed.) (1982): The Family in Transition ,New Delhi: Vikas Publishing House.
2. Coleman,J.C.(1986): Intimate Relationships, Marriage and the Family, Chicago: Macmillan publishing Co.
3. Coser,Rose (1975): The Family: its Structure and Functions,New York: Macmillan Publishing Co.
4. Guppy. G. R. (1976): Family and social Change in Modern India, New Delhi: Vikas Publishing Co.
5. Gore,M.S.(1968): Urbanization and family Change IN India Bombay: popular prakashan.
6. Hutter,Mark (1981): The Changing family :comparative, New York: John Wiley & sons.
7. Srinivasan,K.andMukerji,S.(Eds) (1987): Dynamics of Population and family Welfare ,Bombay: Himalayas Publishing House .
8. Tiss(1994): Enhancing the Role of the Family as an Agency for Social and Economic Development,Bombay:TISS.
9. Augustine,J.S.(Ed)(1982): The Indian Family in Transition,NewDelhi:Vikas publishing house,
10. Chowdhary,Paul D (1988): Youth Participation and development, New Delhi,Atmaram and sons .
11. Devadas T.S. (1979): Hindu Family and Marriage, Madras: University of Bombay.
12. M Desai,K.G.(Ed) (1989): ageing in India ,Bombay:tata Institute of Social Science .
13. Desai, N.andkrishanraj,M.(1987): Women and Society in India ,Delhi: Ajanta publications,
14. Ehta, P. (1977): The Indian Youth ,Emerging Problem and issues, Bombay: Somalia Publicatio
15. NIPCCD (1994): Child in India: A Statistical Profile, New Delhi: NIPCCD

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No.HS 303 -B Family Transition and Population Education

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**3**	**2**	**1**	**3**	**3**	**1**	**3**
CO2	**3**	**2**	**2**	**2**	**3**	**3**	**3**
CO3	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**1**	**3**	**3**	**3**	**3**	**2**	**3**
Average	**2.25**	**2.5**	**2.25**	**2.75**	**3.0**	**2.25**	**3.0**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS303 -B Family Transition and Population Education

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**2**	**2**
CO3	**3**	**3**	**2**	**3**
CO4	**3**	**3**	**3**	**3**
Average	**3.0**	**3.0**	**2.25**	**2.75**

B.Sc. (HOME SCIENCE)
SEMESTER – III
SEC-1: Personality Development

Course No.: HS 305

MM: 40+10=50
Duration of Exam: 3 Hrs.
Course Credit: 2

Instructions for the examiner : The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate : The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.
Course Outcomes: The outcomes of this course are:
CO1. To learn personality development traits that enhance the quality of life
CO2. To acquire professional skills and leadership qualities

UNIT I

1. Personality development traits and types of personality introvert, extroverts.
2. Soft skills training : attitude, body language, self motivation, confidence, self-esteem, optimism etc.
3. Readiness to learn a new language other than mother tongue for effective communication (Listening, Public Speaking, Presenting).
4. Analyse the methods of creative problem solving. Methods to assess strengths /weaknesses.

UNIT II

5. Leadership skills and qualities
6. Importance of proper pronunciation for effective communication.
7. Active listening for effective communication
8. Concept of Mental health.

References:

1. Importance of stress management, time management & goal managementBerger, J.M. (2010). Personality (8th ed.).
2. Belmont, CA: Thomson/Wadsworth Allen, B.P. (2006). Personality theories: Development, growth and diversity (5th ed.). Needham Heights, MA: Allyn and Bacon

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 305 Personality Development

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	2	2	3
CO2	3	3	2	3	2	3	3
Average	3	2.5	2.5	2.5	2	2.5	3

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 305 Personality Development

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3
CO2	3	2	3	2
Average	3	2	2.5	2.5

B.Sc. (HOME SCIENCE)
SEMESTER – IV
CC10: Nutrition in Life Cycle

Course No.: HS 401-A **MM: 60+15=75**
Duration of Exam: 3 Hrs.
Course Credit: 3

Instructions for the examiner : The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate : The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.

Course Outcomes: The outcomes of this course are:
CO1: To understand nutritional requirements during various stages of life.
CO2: To equip with the skills of meal planning by using recommended dietary intake and reference values.
CO3: To Acquire knowledge about nutritional problems during pregnancy and lactation; to plan and prepare diets for pregnancy and lactation.
CO4: To understand the nutritional needs & physiological problems of elderly and plan the diet accordingly.

Unit -1

A. **Concept of balanced diet**

- Basic principles of meal planning and factors affecting meal planning
- Dietary guidelines for Indians, Menu Planning.

B. Nutrition in infancy, recommended dietary allowances for various nutrients, advantages of breast milk over artificial milk with reference to nutritional & immunological qualities. Weaning and supplementary feeding.

C. Recommended dietary allowances, nutritional guidelines, nutritional concerns and healthy food choices for

- Preschool children
- School going children
- Adolescents.

Unit -2

D. Nutrition for adults, definition of reference adult men and women, requirement for different nutrients, dietary consideration for planning the diet for sedentary, moderate & heavy worker (male and female)

E. Physiological changes, recommended dietary allowances, nutritional guidelines, problems, requirement for different nutrients and dietary guidelines for

- Pregnancy
- Lactation

F. Physiological changes, recommended dietary allowances, nutritional guidelines, problems, requirement for different nutrients & dietary guidelines during old age.

References:

1. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd.
2. Khanna K, Gupta S, Passi SJ, Seth R, Mahna R, Puri S (2013). Textbook of Nutrition and Dietetics. Phoenix Publishing House.
3. Wardlaw GM, Hampl JS, DiSilvestro RA (2004). Perspectives in Nutrition, 6th edition. McGraw Hill.
4. Chadha R and Mathur P (eds). Nutrition: A Lifecycle Approach. Orient Blackswan, Delhi. 2015 Gopalan C, Rama Sastri BV, BalasubramanianSC (1989) Nutritive Value of Indian Foods. National Institute of Nutrition, ICMR, Hyderabad.
5. Seth V and Singh K (2005). Diet Planning through the Life Cycle: Part 1
6. Normal Nutrition. A Practical Manual. Elite Publishing House Pvt. Ltd. New Delhi.

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No. HS 401- A: Nutrition in Life Cycle

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**3**	**2**	**1**	**3**	**3**	**1**	**3**
CO2	**3**	**2**	**2**	**2**	**3**	**3**	**3**
CO3	**2**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**2**	**3**	**3**	**3**	**3**	**2**	**3**
Average	**2.25**	**2.5**	**2.25**	**2.75**	**3.0**	**2.25**	**3.0**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 401-A: Nutrition in life Cycle

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**2**	**3**
CO4	**3**	**3**	**3**	**3**
Average	**3**	**3**	**2.75**	**2.75**

B.Sc. (HOME SCIENCE)

Foods & Nutrition Practical

CC10: Nutrition in Life Cycle

Course No.: HS 401-A **MM: 25**

Duration of Exam: 3 Hrs.

Course Credit: 1

Course Outcomes: The course outcomes for this course are-

CO1: To prepare diet plans for various age groups and physiological conditions.

CO2: To calculate the nutritional content provided by these dietary plans as compared with the recommended dietary allowances.

Syllabus :

1. Introduction to meal planning
2. Use of dietary calculation method.
3. Food exchange method.
4. Planning and partial preparation of diets for following: Infants (Weaning foods), Preschool child, School going child, Adolescents, Adults, Pregnant woman, Lactating woman, Adulthood and Old age

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No. HS 401 A Practical: Nutrition in Life Cycle

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**
CO2	**3**	**2**	**2**	**2**	**3**	**2**	**3**
Average	**3**	**2.5**	**2.5**	**2**	**3**	**2.5**	**3**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 401A Practical: Nutrition in Life Cycle

COs/PSOs	PSO1	PSO2	PSO3	PSO4
COs/PSOs	**3**	**2**	**3**	**3**
CO1	**3**	**3**	**3**	**2**
CO2	**3.0**	**2.5**	**3**	**2.5**

B.Sc. (HOME SCIENCE)
SEMESTER – IV
CC10: Food preservation and Community Nutrition

Course No.: HS 401-B

MM: 60+15=75
Duration of Exam: 3 Hrs.
Course Credit: 3

Instructions for the examiner: The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate: The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.

Course Outcomes: The outcomes of this course are:

CO1. To understand various causes of food spoilage and knowledge about microorganisms, their beneficial and harmful effects on food.
CO2. To equip with the skills of food preservation by using different processing techniques.
CO3 To Assess nutritional status of community.
CO4. To understand the nutritional problems prevalent in the community ,their causes and their preventive measures.

Unit 1

A. **Food storage**: Domestic and commercial storage
B. Food Spoilage, its causes and preventive measures
C. **Microorganisms:** types, beneficial effects on food.

D. Food preservation –
- Importance for community,
- Principles of food preservation,

Methods of food preservation:
- Preservation by using low temperature,
- Preservation by use of high temperature
- Preservation by use of preservatives
- Preservation by dehydration
- Preservation by use of osmotic pressure.

Unit - 2

E. Assessment of nutritional status: methods and applications
- Direct methods – anthropometry & clinical examination
- Indirect methods – dietary assessment

F. Common nutritional deficiencies: Aetiology, clinical features & prevention of:
- Protein energy malnutrition.

- Nutritional anaemia
- Vitamin A deficiency
- Iodine Deficiency Disorder

G. Food adulteration (in brief)

References:

1. Wadhwa A and Sharma S (2003). Nutrition in the Community-A Textbook. Elite Publishing House Pvt. Ltd. New Delhi. Park K (2011).
2. Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s BanarsidasBhanot Publishers, Jabalpur, India.
3. Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
4. ICMR (1989) Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad. ICMR (2011)
5. Dietary Guidelines for Indians – A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.
6. Jelliffe DB, Jelliffe ERP, Zerfas A and Neumann CG (1989). Community Nutritional Assessment with special reference to less technically developed countries. Oxford University Press. Oxford. World Health Organization (2006). WHO Child Growth Standards: Methods and development: Length/height-for-age, weight-for-age, weight-for-length, weight-for height and body mass index-for-age (http://www.who.int/childgrowth/standards/en/).

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No. HS 401 B Food Preservation and Community Nutrition

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**3**	**3**	**2**	**2**	**3**	**2**	**3**
CO2	**3**	**2**	**2**	**2**	**3**	**3**	**3**
CO3	**3**	**2**	**3**	**3**	**3**	**2**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**3**
Average	**3**	**2.5**	**2.5**	**2.5**	**3**	**2.25**	**3**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 401 B Food Preservation and Community Nutrition

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**2**	**2**
CO3	**3**	**3**	**2**	**3**
CO4	**3**	**3**	**3**	**3**
Average	**3.0**	**3.0**	**2.25**	**2.75**

B.Sc. (HOME SCIENCE)
Foods & Nutrition Practical
CC10: Food Preservation and Community Nutrition

Course No.: 401-B **MM: 25**

Duration of Exam: 3 Hrs.

Course Credit: 1

Course Outcomes: The outcomes of this course are-

CO1: To learn the skills of preserving food by using various processing techniques

CO2: To assess the nutritional status of a family by using various procedures

Syllabus:

1. Assessment of nutritional status of your own family by using dietary and anthropometric measurements.
2. Preparation, calculation of nutritive value and end point test(wherever applicable) of following products (any 10)

- Jam
- Jelly
- Murabba
- Marmalade
- Pickle sour
- Pickle sweet
- Ketchup and Chutney
- Drying of vegetables
- Squash/ Sharbat
- Fruit crush
- Fruit candy

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No. HS 401 B Practical: Food Preservation and Community Nutrition

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	**3**	**3**	**3**	**2**	**3**	**3**	**3**
CO2	**3**	**2**	**2**	**2**	**3**	**2**	**3**
Average	**3**	**2.5**	**2.5**	**2**	**3**	**2.5**	**3**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 401 B Practical: Food Preservation and Community Nutrition

COs/PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3
CO2	3	3	3	2
Average	3.0	2.5	3	2.5

B.Sc. (HOME SCIENCE)
SEMESTER – IV
CC11: Life Span Development-II

Course No.: HS 402-A **MM: 60+15=75**
Duration of Exam: 3 Hrs.
Course Credit: 3

Instructions for the examiner : The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate: The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.
Course Outcomes: The outcomes of this course are:
CO1: To impart knowledge about scientific study of childhood and adolescence.
CO2: To learn about key areas of childhood and adolescence in context with the influence of peers, school, family and culture.
CO3: To sensitize students to the common challenges and dealing skills to overcome the problems.
CO4: To acquaint students with various ways in which one can create wellbeing in adolescence.

UNIT-I

1. **Physical and Motor Development:**
   a. Physical and motor development in childhood and adolescence.
   b. Puberty, growth spurt (including primary and secondary sexual characteristics).
   c. Motor development: major milestones through end of middle, late childhood and adolescence.
2. **Emotional and cognitive development:** Milestones of emotional development and cognitive development through middle school age to adolescence.
3. **Moral development:** Kohlberg's Stages of Moral development.

UNIT-II

4. **Play** – Meaning, Importance during middle and late childhood, its types (indoor and outdoor) and theories of play
5. **Common behavioral problems and their remedies:** nail biting, lying, depression, stealing, bed wetting, anger, aggression, anxiety, ADHD, substance use.
6. **Socialization**: Meaning of socialization, role of the family and community in socialization of the child.

References :

1. Srivastava S., Rani K.S. (2014): Textbook of Human Development, S.Chand publication, New Delhi.

2. Ambron. S.R. (1975): Child Development, Rinchart press San Francisco.
3. Sinha, D. (1981): Socialization of the Indian Child. New Delhi
4. Rao, P. and Rao, V.N. (1982): Marriage, the family and women in India, New Delhi: Vikas Publications.
5. Augustine, J.N. (Ed.) (1982): The family in transition, New Delhi: Vikas Publishing House
6. Lerner Hultsch (1983): Human Development: a life-span perspective, New York, Mc. Graw Hill Book Co.
7. Coleman, J.C. (1986): Intimate relationships, marriage and the family, Chicago, Macmillan publishing co.
8. Saraswathi, T.S. & Kaur, B. (1993): The development of children. New York: Scientific American books.
9. Cole, M.P. Cole, S. (1993): The development of children. New York: Scientific American books.
10. Gordon, I.J. (1975): Human Development New York: Harper & Row
11. Mussen, P., Conger, J.J. Kagan, J & Huston, A.C. (1945): Child Development and Personality, New York: Harper and Row
12. Srivastav, A.K. (1993): Child and adolescent Psychology: seminar readings New Delhi
13. Mangal SK (1988) General Psychology. Sterling Pub. Co New Delhi

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 402-A Life Span Development-II

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2.5	2	2.5	2	2.5	2.5	3
CO2	2.5	2.5	2.5	2	2	2	3
CO3	2	1.5	2	2.5	2	1.5	2.5
CO4	2.5	2	1.5	3	1.5	2.5	2
Average	2.4	2	2.1	2.4	2	2.1	2.6

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No HS 402-A Life Span Development-II

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3
CO2	2.5	3	2	2
CO3	2.5	3	3	2.5
CO4	2	2.5	3	3
Average	2.5	2.6	2.5	2.6

B.Sc. (HOME SCIENCE)
Human Development Practical
CC11: A Life Span Development-II

Course No.: HS 402-A **MM: 25**

Duration of Exam: 3 Hr
Course Credit: 1

Course Outcomes: The outcomes of this course are:

CO1: To study the influence of peers, school, family and culture on childhood and adolescence
CO2: To sensitize students to the common challenges and dealing skills to overcome the problems.

Syllabus :

1. Observing children in various settings (a) Home setting (b) School setting (c) Outside of Home

2. Recording all round development of children below 12 years (physical, motor, social, emotional, cognitive and language development) by using any five following tests / any other equivalent tests or anecdote :

General Mental Ability Test for Children.
The Parent Child Relationship Scale (PCRD).

a. Emotional Stability Test for Children (ESTC).
b. High School Personality Questionnaire (HSPQ).
c. Adjustment Inventory.
d. Reactions to Frustration Scale (RFS).
e. Children's Approval Seeking Test (CAST).
f. Language Creativity Tests in English and Hindi (LCT).

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 402-A Practical (Life Span Development-II)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	2	2	3
CO2	3	3	2	3	2	3	3
Average	3	2.5	2.5	2.5	2	2.5	3

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 402-A Practical (Life Span Development-II)

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3
CO2	3	2	3	2
Average	3	2	2.5	2.5

B.Sc. (HOME SCIENCE)
SEMESTER – IV
CC11: Adulthood; Guidance and Counseling

Course No.: HS 402-B

MM: 60+15=75
Duration of exam: 3 Hrs.
Credit: 3

Instructions for the examiner: The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.
Instructions for the candidate: The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.
Course Outcomes: The outcomes of this course are:

CO1: To understand various milestones the attributes of an adult during different stages of adulthood.
CO2: To sensitize to the needs & problems of elderly during old age and learn the adjustment to the problems.
CO3: To equip with the skills of counseling by inculcating principles, methods and techniques used in guidance & counseling.
CO4: To inculcate the skills of effective counselling & characteristics of a good counselor.

UNIT I

1. Young Adulthood:
    - Developmental Tasks
    - Physical, Social and vocational Development
    - Parenthood
2. Middle Adulthood:
    - Developmental Tasks
    - Physical changes, Social and vocational Development
    - Mid Life crisis and menopause
3. Late Adulthood:
    - Developmental Tasks
    - Physical changes and health problems
    - Retirement and Grandparenthood
    - Problems and Adjustments in old age and Widowhood
    - Death, dyeing process (Kobbler's theory)

4. Status of aged in society and current old age welfare schemes (SCSS, PMVVY, HelpAge India, and IGNOAPS)

UNIT II

5. Guidance and counseling: Concepts, difference, need, objectives and its scope
6. Principles of guidance and counselling.
7. Types, approaches, and process of counseling.

8. Assessment techniques in guidance & counseling. Skills and characteristics of an effective counselor.

References:

1. Srivastava S., Rani K.S. (2014): Textbook of Human Development, S.Chand publication, New Delhi
2. Rao, P. and Rao, V.N. (1982): Marriage, the family and women in India, New Delhi: Vikas Publications.
3. Augustine, J.N. (Ed.) (1982): The family in transition, New Delhi: Vikas Publishing House
4. Lerner Hultsch (1983): Human Development: a life-span perspective, New York, Mc. Graw Hill Book Co.
5. Coleman, J.C. (1986): Intimate relationships, marriage and the family, Chicago, Macmillan publishing co.
6. Saraswathi, T.S. & Kaur, B. (1993): The development of children. New York: Scientific American books.
7. Cole, M.P. Cole, S. (1993): The development of children. New York: Scientific American books.
8. Gordon, I.J. (1975): Human Development New York: Harper & Row
9. Mussen, P., Conger, J.J. Kagan, J & Huston, A.C. (1945): Child Development and Personality, New York: Harper and Row

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No. HS 402-B Adulthood; Guidance and Counseling

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**3**	**2.5**	**1**	**3**	**3**	**1**	**3**
CO2	**3**	**2.5**	**2**	**2**	**3**	**3**	**2.5**
CO3	**2**	**3**	**3**	**2**	**3**	**3**	**3**
CO4	**2**	**3**	**3**	**3**	**3**	**2**	**2.5**
Average	**2.5**	**2.75**	**2.25**	**2.5**	**3.0**	**2.25**	**2.75**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 402-B Adulthood; Guidance and Counseling

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**3**	**2**	**3**
CO2	**3**	**2.5**	**2**	**2.5**
CO3	**3**	**3**	**2**	**3**
CO4	**3**	**2.5**	**3**	**2.5**
Average	**3.0**	**2.75**	**2.25**	**2.75**

B.Sc. (HOME SCIENCE)
Human Development Practical
CC11: Adulthood; Guidance and Counseling

Course No.: HS 402-B **MM: 25**
Duration: 2 Hrs.
Credit: 1

Course Outcomes: The outcomes of this course are:

CO1: To understand various stages of adulthood regarding their growth and problems.
CO2: To sensitize the students regarding the adjustment problems of elderly.
CO3: To teach the students methods and techniques used in guidance & counseling.
CO4: To inculcate the skills of effective counseling & characteristics of a good counselor.

Syllabus:

1. Visit an old age Centre/ home and report changes in behaviour pattern, physical conditions & habits of old people.
2. Case profile to study young adulthood / late adulthood
3. Visit of counseling center and report writing
4. Preparation of questionnaire related to Problems during pregnancy and menopause period.
5. Visit a Gynecology Centre / Maternity Hospital, filling the questionnaire from pregnant women and women at menopause stage, report writing and presentation.
6. Preparation of any two useful creative materials for adults which can be used during counseling / sold online

Mapping of Course Outcome with Program Outcome (CO/PO)
Paper No. HS 402-B Practical (Adulthood; Guidance and Counseling)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	3	3	1	3
CO2	3	2	2	2	3	3	3
CO3	2	3	3	3	3	3	3
CO4	1	3	3	3	3	2	3
Average	2.25	2.5	2.25	2.75	3.0	2.25	3.0

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
Paper No. HS 402-B Practical (Adulthood; Guidance and Counseling)

CO1	3	3	2	3
CO2	3	3	2	2
CO3	3	3	2	3
CO4	3	3	3	3
Average	3.0	3.0	2.25	2.75

B.Sc. (HOME SCIENCE)
SEMESTER – IV
CC-12
Community Development and Extension Education – I

Course No.: HS 403-A **MM: 60+15=75**
Duration of exam: 3 Hrs.
Credit: 3

Instructions for examiner: The examiner will set nine questions in all, selecting four questions from each section/unit and one compulsory objective type question.

Instructions for candidate: The candidate will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.

Course Outcomes: The outcomes of this course are:

CO1: To understand the concept of society and social structure
CO2: To acquaint students with the types of communication in extension education
CO3: To skill students about Community development programs.
CO4: To impart knowledge about various rural development programs and various ongoing schemesby government and non-government organizations

UNIT -I

A. Meaning and elements of organization and social structure
B. Characteristics of Social systems and its relationship with social structure; Types of society
C. Concept, Importance and functions of Communication
D. Types of Communication:
- Formal and informal
- Verbal and non-verbal
- Written and Visual
- Intrapersonal and interpersonal
- Grapevine

E. Models of communication: Linear model, Interactive model and Transactional model
F. Barriers to communication

Unit II

A. Community Development Programme: Historical background, objectives, activities, achievements and critical analysis

B. Rural Development Programmes and organizations (Establishment year, Objectives and beneficiaries): DWCRA, TRYSEM, Mid-day Meal Programme, Beti Bachao Beti Padhao, PMRY, Skill India, ICDS, MGNREGA, DRDA, FAO, WHO, ICMR, UNICEF, UNESCO, ICAR

C. Role of National and International Non-Governmental Organizations in rural Development (International-Amnesty International, the International Federation of Red Cross and Red Crescent Societies, Oxfam International, CARE, Save the Children)

References:

1. Bhalla, C.L.(2009). Audio Visual Aids in Education. Cornell University.
2. Chitambar, J.B. (2008). Introductory Rural Sociology. New Age International(P) Limited.
3. Dhamma, O.P and Bhatnagar, O.P (2003). Education and Communication for development. Oxfords IBH, New Delhi.
4. Golahait, S. B. (2010). Rural Development programmes in India: Problems and Prospects. Altar Publishing House.
5. Jain, M.(2011).Rural Development Programs in India. Deep and Deep Publications
6. Ray, G.L. (2004). Extension education and Management. Kalyani Publisher, New Delhi.
7. Reddy, A.A.(2001).Extension Education. Bapatla : Sri Lakshmi Press.
8. Sachdeva, D.R. and Bhushan, V. (2007). An Introduction to Sociology. Kitab Mahal Agency, Delhi.
9. Sehgal, S. and Raghuvanshi, R.S. (2007). Textbook of Community Nutrition. ICAR, New Delhi.

Mapping of Course Outcomes to Program Outcomes (CO/PO)
HS 403-A: Community Development and Extension Education - I

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**2**	**2**	**3**	**3**	**3**	**2**	**3**
CO4	**2**	**3**	**3**	**3**	**3**	**3**	**3**
Average	**2.5**	**2.75**	**3**	**3**	**3**	**2.5**	**3**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
HS 403-A Community Development and Extension Education-I

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3
CO2	3	3	3	2
CO3	3	2	3	3
CO4	2	3	3	2
Average	2.75	2.5	2.75	2.5

B.Sc. (HOME SCIENCE)
SEMESTER – IV
CC-12
Community Development and Extension Education – II

Course No.: HS 403-B

MM: 60+15=75
Duration of exam: 3 Hrs.
Credit: 3

Instructions for examiner: The examiner will set nine questions in all, selecting four questions from each section/unit and one compulsory objective type question.
Instructions for candidate: The candidate will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.

Course Outcomes: The outcomes of this course are:

CO1: To understand the concept of Extension education

CO2: To acquaint students with the role of communication in extension education
CO3: To skill students about philosophy and principles of extension teaching methods
CO4: To impart knowledge about various audio, visual and audio-visual aids in extension education and how information can be disseminated by using these aids.

UNIT-I

A. Extension teaching Methods: Its importance and types
- Individual contact method: Farm & home visit, telephone calls, personal letters
- Group contact method: Demonstration, Group meeting and discussion, Conference, seminars and workshops, field trips and campaigns.
- Mass contact method: Print media, Electronic media, Internet based media and Exhibition

B. Print media: Types, nature and characteristics
C. Electronic Media: Radio, Television and Internet
D. Types of ICT in communication: Educational networking; mobile learning, web based learning; classroom equipment and learning

Unit -II

A. Relation between communication and extension education
B. Concept, philosophy and principles of Extension education
C. Qualities of a good extension worker

D. Meaning, classification and functions of audio, visual and audio-visual aids

- Audio aids: Radio, Tape recorder
- Visual Aids: Charts, Posters, Leaflets/pamphlet, PPT, Flash cards, Models, booklet, white board, graphic designs
- Audio-visual aids: Demonstrations, Films, Printed material with recorded sound, Drama, cartoon videos, LCD projector, use of social media.

References:

1. Bhalla, C.L. (2009). Audio Visual Aids in Education. Cornell University.
2. Dhamma, O.P. and Bhatnagar, O.P. (2003). Education and Communication for development. Oxfords IBH, New Delhi.
3. Golahait, S. B. (2010). Rural Development programmes in India: Problems and Prospects. Altar Publishing House.
4. Grover, I. (2002) ed. Communication and Instructional Technology. Aggrotech Publishing Academy, Udaipur.
5. Jain, M. (2011). Rural Development Programs in India. Deep and Deep Publications
6. Ray, G.L. (2004). Extension education and Management. Kalyani Publisher, New Delhi.
7. Reddy, A.A.(2001).Extension Education. Bapatla: Sri Lakshmi Press.
8. Sehgal, S. and Raghuvanshi, R.S. (2007). TextBook of Community Nutrition. ICAR, New Delhi.

Mapping of Course Outcome with Program Outcome (CO/PO)
HS 403-B: Community Development and Extension Education-II

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**2**	**3**	**3**	**3**	**2**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**3**	**3**
Average	**3**	**2.75**	**2.75**	**3**	**3**	**2.5**	**3**

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)
HS 403-B : Community Development and Extension Education - II

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	3	3	2
CO3	3	2	3	3
CO4	2	3	3	3
Average	2.75	2.75	2.75	2.75

B.Sc. (HOME SCIENCE)
SEMESTER – IV
CC-12
Practical
CC12: Computer Applications in Communication and Media Design

Course No.: HS 403-C

MM: 50
Duration of Exam: 3 Hrs.
Credit: 2

Course Outcomes: The course outcomes forthis course are-

CO1: To learn different techniques of designing through computerized methods.
CO2: To prepare various IEC materials with use of multiple software.

Syllabus:

1. Use of Computer Application Designing for Extension and Communication
2. Use of following software for making IEC material and teaching aids:
   - Word processor (Microsoft word / Google Docs)
   - Presentation software (Microsoft PowerPoint / Google Slides, Canva)
   - Adobe photoshop
3. Preparation of Audio-Visual aids using software e.g. charts, pamphlets, posters, flipbooks, leaflets, presentations

References:

1. Khirwadkar A, Pushpanadan, (2006), Information and Communication Technology in Education, Sarup and Sons, Delhi.
2. Sampath K (1998), Introduction to Educational Technology, Sterling Publishers Pvt. Ltd
3. Sagar Krishna (2007), ICTs and Teacher Training, Authors Press, Delhi.
4. Valerie Q (1998), Internet in a nutshell, Shroff Publishers and Distributors Pvt. Ltd, Delhi

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS 403-C (Practical): Computer Applications in Communication and Media Design

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	3	1	2
CO2	3	3	2	2	3	2	2
Average	3	2.5	2.5	2.5	3	1.5	2

Mapping of Course Outcomes to Program Specific Outcomes (CO/PSO)

Paper No. HS 403-C (Practical): Computer Applications in Communication and Media Design

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	3	2	3	3
Average	3	2	3	3

B.Sc. (HOME SCIENCE)
SEMESTER – IV
SEC-2
Basics of Physics

Course No.: HS 404

MM: 40+10=50
Duration of exam: 3 Hrs.
Credit: 2

Instructions for the Examiner:
The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.

Instructions for the Candidate:
The candidates will attempt five questions in all, selecting two questions from each unit as well as compulsory questions.

Course Outcomes: The outcomes for this course are:

CO1: To acquire knowledge about different types of applications in day today's life.
CO2: To understand the concept of household electricity
CO3: To develop skills for handling the equipment& to gain practical knowledge of Instruments and their application.

UNIT-I

1. **Introduction to properties of matter**
(a) Properties of Solids: Density, specific gravity, elasticity, hardness, malleability, ductility.
(b) Properties of liquids: Surface Tension, capillary action, Archimedes Principle, Specific gravity of liquids, fluid pressure.
(c) Properties of gases: Elasticity, compressibility, Atmospheric Pressure, Simple Barometer, Commercial Barometer.

2. **Mechanics**
(a) Units and Measurements: Concepts of measurements and units of length, mass and time
(b) Simple machines: Lever (Definition & Types), Equipment working on the principle of lever (Pulley, Scissors, Egg Beater, Nut Cutter).
(c) Friction: Friction Advantages and disadvantages, concepts of ball bearing, sewing floor, scrubbing machines.
(d) Centripetal and centrifugal forces: spin dryer in washing machine.

Unit- II

3**. Heat**
(a) Introduction to heat: Unit of Heat, Sources and properties of heat, heat and temperature, heat transfer, humidity, relative humidity and dew point.

(b) Application of heat transfer: Household thermometers, pressure cooker, vacuum coffee maker

4. **Household Electricity**

(a) Elementary Knowledge of Electricity: Electric Current (AC & DC), Ohm's Law, Resistance, Sources of electricity (AC Generator & DC Generator, Dry Cell, Thermocouples)
(b) Household electric wiring - Electric meter, household electric wiring and safety features (Fuse, MCB, Earthing).
(c) Battery charger, Inverter, UPS, Voltage stabilizer
(d) Principles of working of basic equipment

- Ovens
- Microwave
- Refrigerator
- Washing Machine

References:

1. Household Physics (2012), Claude H. Brechner, Hard press.
2. Applied Photographic Optics, 3rd Edition, Sidney E. Ray, Focal Press 2002.
3. Modern Physics, Murugesan, S. Chand and Co., 2002.
4. Engineering Physics: Fundamentals and modern applications, P. Khare and A. Swarup, Jones and Bartlett Publishers, 2010
5. Murugesan, Modern Physics, S. Chand and Co., 2002. Bhatia, K.B., Elements of Electrical Gadgets, Arya Book Depot, 1993.
6. College Practical Physics by Khanna and Gulati, S. Chand and Co., (1999)

Mapping of Course Outcomes with Program Outcomes (CO/PO)
Paper No. HS- 404: Basics of Physics

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	2	3	2	3	3
CO2	2	2	1.5	2	2	1.5	1.5
CO3	3	3	3	2	2	1.5	3
Average	2.3	2.6	2.2	2.3	2	2	2.5

Mapping of Course Outcomes to Program Specific Outcomes
Paper No. HS - 404: Basics of Physics

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2.5	2	2
CO2	3	2.5	2	2
CO3	3	3	3	2
Average	3	2.6	2.3	2

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
('A+' Grade, NAAC Accredited)

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(Perform Actions while Stead fasting in the State of Yoga)

Revised Scheme of Examinations and Syllabus of Bachelor of Science (B.Sc.) Programme (Course: Electronic Equipment Maintenance) (CBCS-LOCF)

5th& 6th Semesters
w.e.f. 2022-23 (For IIHS only)

DEPARTMENT OF ELECTRONIC SCIENCE

CBCS-LOCF CURRICULUM (2022-23)

Programme Name: Bachelor of Science (B.Sc.) Programme
(**Course: Electronic Equipment Maintenance**)
(CBCS-LOCF)

(For the Batches Admitted From 2020-2021)

Programme Outcomes (POs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

Programme Specific Outcomes (PSOs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PSO1	Students will be able to acquire the techniques & skills for the basic understanding of the principles and working of various Electronic Equipment and their repair & maintenance.
PSO2	Ability to explore technical knowledge in diverse areas of Electronics and experience an environmentin cultivating the skills for a successful career in repair & maintenance of any Equipment, entrepreneurship as also the higher studies.
PSO3	Ability to design & perform electronic experiments as well as to analyze & suggest effective solutions.

KURUKSHETRA UNIVERSITY KURUKSHETRA

Revised Scheme of Examinations & Syllabus for B.Sc. Non-Medical Programme for the subject of Electronic Equipment Maintenance under Choice Based Credit System (CBCS-LOCF)

V & VI Semesters w.e.f. 2022-23

Sem	Course	Paper Code	Nomenclature	Credits	Workload /Hrs/week	Exam. Duration (Hrs)	Internal Marks	External Marks	Total Marks
							Max.	Max.	
5	**DSE-EEM-5	DSE-EEM-501 (ELECTIVE-I)	Electronic Instrumentation	2	2	3	10	40	50
			Computer Hardware & Maintenance-I						
		DSE-EEM-502 (ELECTIVE-II)	Consumer Electronics	2	2	3	10	40	50
			Transducers and Sensors						
		EEM-503	Major Project	2	4	3	10	40	50
	TOTAL			**06**	**08**	**-**	**30**	**120**	**150**
6	**DSE-EEM -6	DSE-EEM-601 (ELECTIVE-III)	Electronic Equip. Maintenance	2	2	3	10	40	50
			Computer Hardware & Maintenance-II						
		DSE-EEM-602 (ELECTIVE-IV)	Biomedical Equip. Maintenance	2	2	3	10	40	50
			Embedded Systems & Robotics						
		EEM -603	Practical	2	4	3	10	40	50
	TOTAL			**06**	**08**	**-**	**30**	**120**	**150**

**** DSE (Discipline Specific Elective).**

Important Instructions:-

1. A student can opt for one paper out of the list of elective papers provided against each paper code for respective semester.
2. One credit equivalent to 1 hour of teaching/2 hours of Practical work.
3. One credit equivalent to 25 marks.
4. Teaching workload will be calculated on the basis of teaching contact hours of the course.
5. The Practical examination will be held at the end of odd and even semester in one session of three hours duration.
6. For Practical/Project work, a maximum of 15 students are allowed in one group during course of study and also in Examination.
7. During Practical Examination, a candidate is required to perform one experiment from the prescribed list of experiments.
8. Distribution of Marks in Practical Examination B.Sc. I, II, III, IV& VI Semester):
   I. Internal Marks: 10
   II. Experiment Performed: 15
   II. Lab Record: 10
   IV. Viva/Voce : 15
9. Distribution of Marks in Major Project (Paper EEM-504) of B.Sc. V Semester:
   I. Internal Marks: 10
   II. Project Developed: 15
   II. Project Report: 10
   III. Viva Voce: 15

Course Code: DSE-EEM-5	Course Name: ELECTRONIC INSTRUMENTATION
Paper Code: EEM- 501 Elective-I; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the basic fundamental concepts of various types of Electronic Instruments.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the basic concepts and characteristics of electronic instruments.
CO2	Demonstrate the working principle and utilities of various types of bridges.
CO3	Familiarize with the fundamentals of various types of transducers and their applications.
CO4	Learn the concepts of acquiring the data from any of the transducers.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	3	3	2	2	3	2	3	2
CO2	3	3	2	2	2	3	2	3	1	2	2
CO3	2	3	3	3	2	2	2	2	2	1	2
CO4	3	2	2	3	3	3	2	3	3	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	3	2	3
CO2	2	3	3
CO3	3	2	3
CO4	2	3	3

Unit-I

DC and AC indicating Instruments: Accuracy and precision, Types of errors, PMMC galvanometer, Sensitivity, Loading effect, Series Type and Shunt type Ohmmeter, Multimeter. Watthour Meter, Power Factor Meter.

Unit-2

DC and AC Bridges & their Applications: General Conditions for Bridge Balance of Wheatstone Bridge, Kelvin Bridge, Maxwell Bridge, Hay Bridge, Schering Bridge, Wein Bridge, Wagner Ground Connection.

Unit- 3

Transducers: Classification, Active, Passive, Mechanical, Electrical, their comparison. Selection of Transducers, Principle and working of following types: Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, Semi-conductor strain gauge) Capacitive (diaphragm), Inductive (LVDT-Principle and characteristics, Temperature (electrical and non-electrical), Piezoelectric (Element and their properties, Piezoelectric coefficients. Equivalent circuit and frequency response of P.E. Transducers)

Unit- 4

Photosensitive Transducers: (photo-conductive, photo emissive, photo voltaic, semiconductor, LDR).
Data acquisition systems: Block diagram, brief description of preamplifier, signal conditioner, instrumentation amplifier, waveform generator, A/D and D/A converter blocks, D/A and A/D Multiplexing, computer controlled test and measurement system.

References:

1. Instrumentation Measurements and Analysis by Nakra & Choudhary; TMH
3. Electrical & Electronic Measurements & Instrumentation by A.K. Sawhney
4. Electronic Instrumentation and Measurements Techniques by W.D. Cooper; PHI

Course Code: DSE-EEM-5	Course Name: COMPUTER HARDWARE & MAINTENANCE-I
Paper Code: EEM- 501 Elective-I; Option (ii)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the basic concepts of various types of computer hardware and its maintenance.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the basic concepts of the working of a PC system and functions of its main parts.
CO2	Familiarize with the importance of BIOS, Bus System, and primary and secondary memories in a PC.
CO3	Learn the functionsand mechanism of different types of computer peripheral devices.
CO4	Understand the concepts of computer communication and software in a PC System.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	2	2	3	3	3	2	3	2	2	1	2
CO3	3	3	3	3	2	2	2	2	1	3	1
CO4	3	2	2	2	3	3	3	3	3	2	3

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	2	3
CO4	3	3	3

Unit-I

Personal Computer: Evolution PC through Pentium; specifications of differentstyles of PCs,Functional Block diagram, System Unit and its various parts, Introduction to peripheral parts, Input/Outputports (serial port, parallelport, game port, USBport).Motherboard (MB), motherboard Layouts with specifications, motherboard items, SMPSand linear power supply (Brief Idea and comparison).

Unit-II

Basic Input/output System (BIOS): services, features and functional parts of BIOS, Bus Standards: BUS Architecture with basic specifications (XT, ISA, EISA, MCA, VL, PCI)
On Board Memory & Magnetic Media: PC Memory Organization, Types of RAM, MemoryPackages, Magnetic Storage (Fundamentals, Diskette basics, FDDTypes and capacity, HDD, FDD &HDD sub-assemblies, HDD controller & interface types) Disk organization inDOS.

Unit-III

Input Devices:Keyboard (basics, operation, types, functions, signals, interfacelogic); Mouse (principle of operation, types, signals);Scanner (principle of operation, types).
Output Devices: VDU (Video basics, types of display adaptors, Basic mechanism of CRT Controller); Printer (printing mechanism, types: DMP, Inkjet, Laser Printer, MFP, Data transfer b/w PC & Printer).

Unit-IV

CD-ROM Drive: Principle of operation, merits and demerits, CD/DVD Diskette construction and R/W mechanism, Comparison of CD andDVD, Caring for CD and DVD discs, front and rearview details of CD/DVD drives.
Computer Communication: Modem basics and principle of operation, Internet and itsfeatures.
Software Concepts: System software, application software, operating systems, MSDOS and Windows (Introduction and differences).

References:

1. IBM PC Clones by Govindarajalu
2. PC Hardware: The Complete Reference by C. Zacker, J. Rourke

Course Code: DSE-EEM-5	Course Name: CONSUMER ELECTRONICS
Paper Code: EEM- 502 Elective-II; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the fundamental concepts of popular consumer gadgets and appliances.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the basic mechanism and application of various audio and video systems.
CO2	Understand the working mechanismof commonly used domestic appliances.
CO3	Learn day to day maintenance of commonly used domestic appliances.
CO4	Familiarize with utilities of various popular office gadgets and digital access devices.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	2	3	3	2	2	2	2	2
CO2	3	3	3	3	2	2	3	2	3	1	3
CO3	3	3	3	3	2	2	3	1	1	3	2
CO4	3	3	2	3	3	3	2	3	3	2	1

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	2	3	3
CO2	3	2	3
CO3	2	3	3
CO4	3	3	2

Unit-I

Audio and Video systems: Block diagram and basic working mechanism of PA system, Microphone, HDTV, DVD players, MP4 players, Set Top box, Digital cable TV, LCD, Plasma & LED TV. Projectors: DLP, Home Theatres, Remote Controls. Digital Camera, Handicam.

Unit-2

Microwave Ovens: Microwaves (Range, block diagram, Single-Chip Controllers, types of Microwave oven, Wiring and Safety instructions, care and Cleaning).
Washing Machines: Electronic controller, hardware and software, Types of washing machines, Fuzzy logic washing machines, Features of washing machines, maintenance.
Air Conditioners: Air Conditioning, Components of air conditioning systems, types of air conditioning systems (unitary, central and split air conditioning systems), maintenance.
Refrigerators, Dish Washer, Vacuum Cleaners: Block diagram, basic working mechanism, maintenance.

Unit-3

Electronic Gadgets and Domestic Appliances: Facsimile machine, Xerographic copier, calculators (Structure of a calculator, Internal organization of a calculator, servicing electronic calculators), Digital clocks (Block diagram and its working mechanism), Home security system, CCTV.

Unit-4

Digital Access Devices: Types, Block diagram and basic working mechanism of Printers, Barcode scanner and decoder, Electronic Fund Transfer, Automated Teller Machines (ATMs).
Landline and Mobile telephony: Block diagram and basic working mechanism of Basic landline equipment, Cordless, Mobile phones: GPRS & Bluetooth, GPS Navigation system.

References:

1. Consumer Electronics by S. P. Bali; Pearson Education
2. Consumer Electronics for Engineers by Philip Herbert Hoff

Course Code: DSE-EEM-5 **Paper Code: EEM- 502** Elective-II; Option (ii)	**Course Name: TRANSDUCERS AND SENSORS**
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the fundamental concepts of transducers and sensors and their applications.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the basic concepts of electronic instrumentation..
CO2	Learn different types of errors existing in various measuring instruments.
CO3	Understand the mechanism of various types of transducers in measuring various physical quantities.
CO4	Familiarize with popular sensors and their applications in electronic instruments.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	1	1	1
CO4	3	2	2	2	3	3	3	3	3	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	2
CO4	2	3	3

Unit-I

Basic concepts of Instrumentation: generalized instrumentation systems block diagram representation, scope of instrumentation in Industrial organization. Measurement systems: static (accuracy, sensitivity, linearity, precision, resolution, threshold, range, hysteresis, dead band, backlash, drift), impedance matching and loading, dynamic characteristics (types, fidelity, speed of response, dynamic error).

Unit-2

Definition of errors: systematic errors, instrumental errors, environmental errors, random errors, loading errors, random errors, source of errors in measuring instruments, Uncertainties types, propagation of uncertainties)

Unit- 3

Transducers: Classification, Active, Passive, Mechanical, Electrical, their comparison. Selection of Transducers, Principle and working of following types: Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, bridge circuits, Semi-conductor strain gauge) Capacitive (diaphragm), Inductive (LVDT-Principle and characteristics, Hall effect sensors).

Unit- 4

Sensors: Piezoelectric (Element and their properties, Piezo Electric coefficients. Equivalent circuit and frequency response of P.E. Transducers), light (photo-conductive, photo emissive, photo voltaic, semiconductor, LDR), Temperature (electrical and non-electrical). Pressure (force summing devices, load cell)

Suggested Books:

1. Measurement Systems by Doeblin& Manek; McGraw Hill,New York
2. Electronic Instrumentation by H.S Kalsi; McGraw Hill, 4th edition
3. Measurement & Instrumentation by DVS Murthy; PHI
4. Sensors and Transducers by D. Patranabis; PHI, 2nd edition

Course Code: DSE-EEM-5	Course Name: MAJOR ROJECT	
Paper Code: EEM-503		
Type: DSE Course;	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to train the students to learn hand-on practice by developing a Lab. Project on the basis of already studied theoretical and practical concepts.

Course Outcomes (CO): At the end of this course, with an advisory support from a faculty member as Supervisor, the students will be able to:

- Acquire advanced practical skill/knowledge.
- Develop any productive idea based on Electronics fundamentals in solving a problem encountered in daily life.
- Hand-on practice in developing the project with an experimental investigation in the Lab.
- Applythe knowledge in solving/analyzing/exploring a real life problem.

Course Details: The Student should design, fabricate and assemble one Electronic project in their respective Institute/Department. After successful completion of Lab. Project, each student would prepare a report and submit it at the time of the final examination duly certified by the concerned faculty guide (as an Internal Examiner) and an External Examiner, deputed by the University. Institute/Department faculty shall ensure that the entire project work is carried out in their respective Institute/Department by utilizing the Lab. Classes assigned and, therefore, will be able to:-

- demonstrate creativity and critical thinking ability
- gain confidence in application of theoretical knowledge to practical aspects
- design circuits, PCB and solder components on the PCB
- final testing of the project and fault finding and rectification (if any)

Process of doing Project/Dissertation:

- Familiarity with research ethics & plagiarism
- Literature review
- Problem formulation and definition of the project work
- Modular design and its implementation
- PCB design and soldering of the tested circuit
- Report writing
- Correction by Supervisor
- Printing & Hard binding

Evaluation of Project:

- Internal Assessment (Lab. Work: 5 + Attendance: 5 Marks)
- Distribution of External Marks (40): Project Demonstration (10), Project Report Evaluation (10) and Viva-Voce (20): Evaluation of Project would be carried out by two examiners (the Supervisor, as an Internal Examiner and an External Examiner)

Course Code: DSE-EEM-6	Course Name: ELECTRONIC EQUIPMENT MAINTENANCE
Paper Code: EEM- 601 Elective-III; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to train the students with the troubleshooting concepts of electronic equipment.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the fundamentals of troubleshooting procedure and their evolution in general.
CO2	Learn the steps for the installation, maintenance and repair of generalequipment.
CO3	Familiarize with the servicing practices of surface mount devices.
CO4	Understand safety measures& maintenance management concepts for electronicequipment.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	2	3	2	2	3	2	2	2
CO2	3	2	3	2	2	3	2	3	2	1	3
CO3	3	2	3	2	2	2	2	3	2	2	2
CO4	3	2	3	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	2	2	2
CO2	2	2	2
CO3	2	3	3
CO4	2	3	3

Unit-I

Fundamental Troubleshooting Procedures: Equipment Failures, Causes of Equipment Failure, Nature of faults, Failure Rate, Mean Time Between Failures, Mean Time to Fail, Maintainability, Mean Time to Repair, Availability, Redundancy.
Maintenance Aids and Records: Test Instruments, Tools, Service Manual & its Importance, Logbook & its significance, Policy of a Service Engineer, Maintenance Terminology & Policy, Stages of Maintenance.

Unit-II

Troubleshooting and Repair Procedure: Steps in Troubleshooting,Troubleshooting Process, Fault-Finding Aids, Identification of Faulty Stage, Identification of Faulty Component, Intermittent Faults, Fault Detection and Repair, Troubleshooting Techniques (preliminary observations, troubleshooting methods, systematic troubleshooting checks, thumb rules in troubleshooting).

Unit-III

Rework & Repair of Surface Mount Assemblies: Surface Mount Technology, SMDs, Surface Mounting Semiconductor Packages, Packaging of Passive Components as SMD, Repairing SM PCBs.
Installation and Safety Measures: General Installation Guidelines, Preparation of Site, Provision of Suitable Physical Environment, Calculation of Power requirement, Layout of Electric and Signal Leads, Artificial Earth, General Safety Measures for Electronic Systems.

Unit-IV

Preventive Maintenance: Indications for Preventive Maintenance Action, Preventive Maintenance of Electronic Circuits, Preventive Maintenance of Mechanical Systems.
Maintenance Management: Objectives, Maintenance Policy, Equipment Service Options, Essentials of a good Equipment Management Programme, Installation Procedures, Service and Maintenance Laboratory, Documentation, Professional Qualities and Work Habits.

References:

1. Troubleshooting and repairing consumer electronics by Homer Davidson (McGraw Hill)
2. Modern Electronic Equipment: Troubleshooting, Repair and Maintenance by R.S. Khandpur

Course Code: DSE-EEM-6	Course Name: COMPUTER HARDWARE & MAINTENANCE - II
Paper Code: EEM- 601 Elective-III; Option (ii)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to train the students with the troubleshooting concepts of computer system maintenance.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the fundamentals concepts in the installation of a PC System.
CO2	Familiarize with diagnosis of common symptoms of faulty peripherals of a PC System.
CO3	Learn the troubleshooting techniques of various peripherals of a PC System.
CO4	Learn basic steps for the maintenance and upgradation of a PC System.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	2	1	2
CO4	3	3	2	2	3	3	2	3	2	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	3	2	3
CO2	2	3	3
CO3	3	2	3
CO4	2	3	3

Unit-I

PC Installation: Room Preparation (Location, PC room pollution, air conditioning with principle of operation of an AC system, false flooring & false ceiling, fire protection system); PC Installation (basic steps).Boot Process (DOS & Windows), basic functions of POST and its test sequences.
Power Supply for PC: Clean power supply, p.s. problems, power conditioning, servo stabilizer, CVT, offline and online UPS (basic idea).

Unit-II

Troubleshooting PC Faults-I: Motherboard:possible problems, diagnosis procedure and their troubleshooting; Keyboard (checks for proper functioning, possible problems, diagnosis procedure and their troubleshooting),Mouse(troubleshooting common symptoms), Monitor (troubleshooting commonsymptoms), Printers (possible problems, diagnosis procedure and theirtroubleshooting).

Unit-III

Troubleshooting PC Faults-II: CDROM (Installation upgradation, replacement, troubleshootingcommon symptoms), FDD (Installation, replacement and troubleshooting common symptoms), HDD (Preparation Concepts, installation, replacement and troubleshooting common symptoms),Memory (upgradation, installation, and troubleshooting common symptoms)

Unit-IV

General PC Servicing:PC maintenance using various diagnostic S/W, universal troubleshootingprocess,computer viruses and their types, virus protection techniques, quick startbench testing, tips for windows startup problems.
PC Upgrading: Introduction, Upgrade Essentials, Performance Upgrade, Capacity Upgrades, Features Upgrades.

References:

1. IBM PC Clones by Govindarajalu
2. PC Hardware: The Complete Reference by C. Zacker, J. Rourke
3. PC Hardware by Ron Gilster

Course Code: DSE-EEM-6	Course Name: BIOMEDICAL EQUIPMENT MAINTENANCE
Paper Code: EEM- 602 Elective-IV; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the foundations of biomedical engineering.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with working principle and applications of various types of biomedical instruments.
CO2	Understandsignal analysis and various types of electrodes used in various biomedical instruments.
CO3	Familiarize with role of various types of sensors in biomedical instruments.
CO4	Understand the utility of monitoring, imaging and therapeutic instruments in biomedical sciences.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	3	3	2	2	3	2	2	2
CO2	3	3	2	3	3	2	1	2	3	2	-
CO3	3	3	3	2	2	3	2	3	2	2	2
CO4	3	3	3	3	2	3	2	2	2	1	1

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	3	3	3
CO2	3	3	2
CO3	2	2	3
CO4	3	3	2

Unit 1

Basic medical Instrumentation System, Desirable Characteristics and Performance Requirements, General Constrains in design of Medical Instrumentation.
Origin of Bioelectric signals, Resting and action potential, Various Bioelectric Potentials and heir waveforms (ECG, EEG, EMG); Bio-Potential Electrodes: Equivalent circuit model of Electrode, Various types Recording Electrodes (Surface, Micro, Needle, Array electrodes).

Unit -2

Physiological Sensors: Optical Fibre Sensors, Photometric Sensors, Pulse Sensors, Chemical Sensors, Biosensors, Smart Sensors.
Biomedical Equipment: (Principle of operation and Application) Electrocardiograph (ECG), Electroencephalograph (EEG), Electromyography (EMG).
Patient Monitoring Systems: Basic Principal and Mechanism of Cardiac Monitor, Heart Rate, Pulse Rate.

Unit- 3

Analytical Instruments(Principle of operation and Application):Blood Gas Analyzers (pH & PCO_2 Measurement, Blood Cell Counter, Colorimeter, Spectrophotometer, Oximeter.
Imaging systems (Basic principle, Block diagram, Biological Effects, Advantages): X-ray machine, Computed Tomography (CT), Magnetic Resonance Imaging System.
Therapeutic Equipment: (Principle of operation and Application) Cardiac pacemakers, Hemodialysis machine, Ventilators, Humidifiers, Nebulizers.

Unit -4

Basic principle and operation: Bedside patient monitor, Blood pressure Measurements, Audiometers and hearing aids, Single Channel Telemetry Systems and telemedicine.
Patient Safety medical equipment: Electrical Shock Hazards, Leakage current, safety codes for electro medical equipment, Electric safety analyzer, Testing of biomedical equipment.

References:

1. Khandpur R. S. - Handbook of Biomedical Instrumentation, TMH
2. L.Cromwell et al- Biomedical Instrumentation and Measurements PHI

Course Code: DSE-EEM-6	Course Name: EMBEDDED SYSTEMS & ROBOTICS
Paper Code: EEM- 602 Elective-IV; Option (ii)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to learn the foundations of embedded systems and robotics engineering.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Learn the basics of popular microcontroller 8051, including memory map, interrupts, programming, etc.
CO2	Understandfundamentals of an embedded system and its basic design concepts.
CO3	Familiarize with interfacing techniques of a microcontroller in developing embedded systems.
CO4	Acquire the fundamental knowledge of Robotics and utility of embedded system in robotics technology.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	3	2	3	2
CO2	3	2	3	3	2	3	2	2	2	2	2
CO3	3	3	3	3	2	3	2	2	1	1	2
CO4	3	3	3	2	3	2	2	3	3	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	3	2	3
CO2	2	3	3
CO3	3	2	3
CO4	2	3	3

Unit 1

Introduction to RISC microcontrollers: Von- Neumann and Harvard architectures, Introduction to 8051 family microcontrollers, 8051 architecture, Register banks and Special Function Registers, Block Diagram, Addressing Modes, Instruction Set, Timers, Counters, Stack Operation, Programming using PIC microcontroller.

Unit 2

Introduction to Embedded Systems: Overview of Embedded Systems, Features, Requirements and Applications of Embedded Systems, Recent Trends in the Embedded System Design, Common architectures for the ES design, Embedded Software design issues, Communication Software, Introduction to Development and Testing Tools

Unit 3

8051 Interfacing: 8051 interfacing with Keyboard, display Units (LED, 7-segment display, LCD), ADC, DAC, Stepper motor, Introduction to AVR family and its architecture. Interfacing and Communication Links Serial Interfacing: SPI / Micro wire Bus, I2C Bus, CAN Bus

Unit 4

Robotics: Overview of Robotics, Pattern recognition and robots, Use of Embedded Systems in Robotics, Robots and Computer Vision.

References:

1. Design with PIC Microcontrollers by John B. Peatman (Pearson Education).
2. Embedded C Programming and the Microchip PIC by Richard Barnett, Larry O'Cull and Sarah Cox.
3. Robotic Engineering – An Integrated Approach by Richard D Klafter, Thomas A. Chmielewski and Michael Negin (PHI).

Course Code: DSE-EEM-6	Course Name: PRACTICAL
Paper Code: EEM-603	
Type: DSE Course ;**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work
External Maximum Marks: 40;	**Internal Maximum Marks:** 10

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: Minimum 6 experiments are to be performed in the Semester.

Electronic Instrumentation and Computer Maintenance

1. Study the mechanism of CD-ROM/DVD Drive by noting voltages at various check points and its installation.
2. Installation and set-up of CCTV Camera(s) with DVR for the purpose of Home/Office Security.
3. Maintenance and servicing of Xerox Machine.
4. Measurement using R/L/C transducer.
5. Measurement of R/L/C utilizing following Bridges (any two)
   (i) Kelvin's Bridge (ii) Maxwell Bridge (iii) Schering Bridge
6. To study the Characteristics of LDR and Photodiode with:
   (i) Variable Illumination Intensity.
   (ii) Linear Displacement of source.
7. Recording of ECG and identification of various peaks in ECG waveform.
8. Measurement of Heart Rate using conventional and modern electronic stethoscope. (an activity can be given for the design of electronic stethoscope using condenser Microphone)
9. Measurement of respiratory rate and various tidal volumes using spirometer. (an activity can be given for the design of respiratory rate monitor using Strain gauge/thermistor)
10. Measurement of body temperature using conventional mercury `thermometer and modern electronic thermometer. (an activity can be given for the design of electronic thermometer using thermistor/thermocouple).
11. Write a program to convert a digital signal to analog signal using 8051 and PIC microcontrollers.
12. Write a program for temperature sensor interfacing through serial port on 8051 and PIC microcontroller kits.
13. Write a program for P W M control of DC Motor/Stepper Motor using 8051 and PIC microcontrollers.
14. Installation of Windows operating system and other software.
15. Installation of peripheral devices (Scanner, Printers) in a PC system.
16. Maintenance and cleaning of diskette drives, keyboard, mouse, etc.
17. To identify various cards, assembly and disassembly of a PC system.
18. Familiarization of Diagnostic tools and Antivirus Software for the repair/maintenance of PC.